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# AN ASSESSMENT OF INTELLIGENCE, PSYCHOLINGUISTIC ABILITIES AND LEARNING APTITUDES AMONG PRESCHOOL CHILDREN.

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RESEARCH IN PRESCHOOL EDUCATION HAS PRODUCED VARIED RESULTS, BUT IT IS FELT THAT THE EARLIER THERE IS INTERVENTION INTO UNSATISFACTORY EDUCATIONAL DEVELOPMENT, THE MORE EFFECTIVE WILL BE THE EFFORT TO REDUCE EDUCATIONAL DISABILITIES. THIS STUDY WAS DESIGNED TO INVESTIGATE THE NATURE AND DEGREE OF CHANGE IN THE PERFORMANCE OF FOUR-YEAR OLD CHILDREN BEFORE AND AFTER A PRESCHOOL TRAINING PROGRAM. THE SUBJECTS WERE APPROXIMATLEY 150 FOUR-YEAR OLD CHILDREN FROM THREE HEAD START CENTERS IN A LARGE EASTERN CITY. EACH SUBJECT WAS ENROLLED IN A YEAR-LONG PRESCHOOL PROGRAM AND WAS GIVEN A BATTERY OF TESTS AT THE BEGINNING AND END OF THE TERM. THE TESTS USED WERE (1) THE STANFORD-BINET, L-M, 1960 REVISION, (2) THE ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES, AND (3) THE DETROIT TESTS OF LEARNING APTITUDE. THE OBJECTIVE OF THE PRESCHOOL PROGRAM WAS TO IMPROVE THE CHILD'S SELF-IMAGE, LINGUISTIC ABILITIES, SOCIAL-EMOTIONAL DEVELOPMENT, AND PRE-ACADEMIC CONCEPTS. THE TEST RESULTS INDICATED THAT THE CHILDREN'S IQ SCORES, PSYCHOLINGUISTIC ABILITIES, AND LEARNING APTITUDES IMPROVED. THERE WAS NO CONTROL GROUP USED, THEREFORE, NO CONCLUSION COULD BE EXPRESSED AS TO THE VALUE TO SUBJECTS OF SUCH A PROGRAM COMPARED WITH NO PROGRAM AT ALL. BUT IT WAS CONCLUDED THAT HEAD START DOES HELP THOSE CHILDREN IN NEED OF A HEAD START. (WD)

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# AN ASSESSMENT OF INTELLIGENCE, PSYCHOLINGUISTIC ABILITIES AND LEARNING APTITUDES AMONG PRESCHOOL CHILDREN

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John F. Cawley

The University of Connecticut

1966

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JFC

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# INTRODUCTION

Successful intervention in the regression toward educational disability involves the combination of behavioral and social forces interacting with the child and the environment in which he functions. Recent studies suggest that the preschool period would be an appropriate time to institute procedures through which the accumulation of developmental deficits among disadvantaged children can be interrupted. The discrepancy between developmental status and chronological age among children of varying socioenvironmental levels increases in a pattern which clearly indicates that youngsters in disadvantaged areas are disproportionately underachieving in relationship to chronological age. Mackler et al (1965) cite data that show 30.0 per cent of third grade pupils and 80.9 per cent of sixth grade pupils in twenty urban schools achieved below grade level in reading comprehension. Among these same children the percentage of subjects performing above grade level decreased from 21.6 in the third grade to 11.7 in the sixth grade. A study by Kennedy, Van De Riet and White (1963) disclosed a similar pattern in regard to intellectual characteristics. Among 1800 subjects with a mean IQ of 80.7, the sample of five year old children had a mean of 86 and the thirteen year old subjects had a mean of 65; the decline is noteworthy.

A significant number of the programs developed under the auspices of Title I of the Elementary and Secondary

Education Act and The Economic Opportunity Act have been designed to counter these patterns of progressive decrement by providing a variety of compensatory programs.

The relevance of the aforementioned to preschool developmental programs cannot be denied. It is reasonable to assume that the earlier the intervention process can be introduced, the more effective the effort to reduce educational, social and personal disability among disadvantaged children. This does not imply that the "burden of cure" rests with preschool programs. A headstart is only one step on the ladder of achievement. Continuous research and experimentation is necessary in order to determine the role and contribution of the parameters of the compensatory sequence. The inability of any phase to perform miracles cannot be construed as failure, whereas even the modest enhancement of an individual, or a group of children, may be seen as a basis for an intensive evaluation of a given program. Research in preschool education has produced a variety of results.

Preschool participants (Gray and Klaus, 1965) showed an IQ gain from 86 to 95 and maintained this 9 point increase over a 27 month period. Non-participating control samples decreased 4 and 6 points respectively.

A preschool study directed by Hartman (1965) contrasted participants in various combinations of experimental programs. Subjects receiving summer preschool combination programs failed to demonstrate significant differences in intelligence quotients or language quotients over controls. Subjects who experienced combinations of preschool and preschool and kindergarten programs were not significantly superior over controls in measured intelligence, language development or reading readiness.

Results from a study of a diagnostically based curriculum upon preschool mentally retarded children (Spicker, Hodges and McCandless, 1966) showed that experimental children derived substantial benefits in the areas of cognitive attainment and psycholinguistic abilities.

Blatt and Garfunkel (1965) studied the "educability of intelligence" among preschool mentally retarded children. No significant intellectual differences were noted between experimental and control subjects over the three-year tenure of the project.

The project described herein is global in character, and clinical and descriptive, rather than inferential, in its management of the data. The global character of the project is reflected in a broad approach to assessment and a diversified preschool program.

The comprehensive evaluation includes measures of intellect, language status, social adjustment, developmental information and visual attention span. This battery of tests was assembled to obtain a general description of preschool disadvantaged children. There was no attempt to substantiate a particular theory about the nature of developmental deficit, nor was there any effort made to seek a teleological doctrine. The problem was to attempt an assessment of the development and changes in behavior of children who participated in a headstart program.

The subjects for this project came from three preschool programs which, although operating in concert with one another in philosophical orientation and curriculum purpose, maintained their identity with respect to their unique qualities and the requirements of the individuals whom they served.

The data acquired in the present project are subject to the acknowledged limitations and interpretations inherent in any psychological battery, as well as to the hazards encountered in assessing preschool children. The use of normative data was restricted due to limitations in the instrumentation. The Illinois Test of Psycholinguistic Abilities (McCarthy and Kirk, 1961) included only white children in its standardization, whereas in excess of ninety per cent of the present subjects were Negro. The Detroit Tests of Learning Aptitude (Baker and Leland, 1935, 1958) give meager data concerning the reliability, validity and adequacy of norms. Nevertheless, the comprehensive possibilities of the battery combined with the development and utilization of frequency distributions, a reliance on raw scores and a selected use of norms outweighed the restrictions cited above.

## PROCEDURE

The present project called for a comprehensive evaluation of approximately one hundred and fifty four-year old children. The subjects represented the population of three Headstart Centers in a large eastern city. Each child was enrolled in an academic year program on a two-and-one-half hour daily basis. The initial battery was administered at the beginning of the school year and the post-test battery was administered at the conclusion of the year.

The following tests were included in the battery, which was individually administered:

1. Stanford-Binet, L-M, 1960 revision.
2. The Illinois Test of Psycholinguistic Abilities.
3. The Detroit Tests of Learning Aptitude.
    a. Motor Speed
    b. Oral Commissions
    c. Social Adjustment A
    d. Visual Attention Span for Objects
    e. Orientation
    f. Social Adjustment B

One or more groups of examiners were assigned to each center. A group consisted of three individuals, one of whom administered the Stanford-Binet, another who administered the Illinois Test of Psycholinguistic Abilities and a third who administered the Detroit Tests of Learning Aptitude.

The battery was administered without regard to any particular arrangement. The list of subjects' names were posted at the center and they were evaluated as they became available.

An effort was made to evaluate every youngster on all three tests. The pre-test sample was 178 and the post-test sample numbered 162. Due to family movement and related transitional problems and abseenteeism, only 112 subjects received all three pre-tests and all three post-tests. In order to maximize the number of subjects, the final comparisons were made with subjects who had been pre- and post-tested on any test. The final tally showed 138 on the Stanford-Binet, (SB), 136 on the Illinois Test of Psycholinguistic Abilities, (ITPA), and 134 who received the Detroit Test of Learning Aptitude, (DTLA)

The data were managed with four techniques. Pre- and post-test comparisons of the difference between means were tested by use of a "t" for correlated means. Product-movement correlations between pre- and post-test scores were obtained. A frequency distribution of each subtest was tabulated. This latter procedure was employed because of the lack of adequate data on the DTLA, and the fact that the ITPA did not include any Negro children in its standardization. The final procedure was to transform the raw scores into language age or mental age equivalents and to develop profiles.

# THE PRESCHOOL PROGRAM

by

Jeraldine Withycombe

In attempting to explain the growth seen in children having had a year's experience in the Hartford Board of Education Child Development Program, it would be well to "spell out" what the children experience in the preschool situation. The 1965-66 preschool session was broken down as follows:

50 mins. - Multi-choice activities
10 mins. - Perceptual Motor Exercises
30 mins. - Clean-up, bathrooming, snack and conversation and rest
45 mins. - Programmed Motivational activities
15 mins. - Clean-up and play -- indoors or out

What actually takes place during these time blocks? During the multi-choice activities time the children are free to select activities and materials from among those provided for that day (provided on the basis of the teacher's diagnosis of specific children and the group). There are always science materials available... experimentation with sound, blocks, plants, animals, etc. There are always paints, crayons, paper, etc. to encourage the child to experiment with color, form, creative art or just seeing what materials will do -- what he, the child, can do with them. There is clay, playdough, pieces of cloth, paper, tree cones, etc. There are books, records, dress-up clothes and climbing equipment.

The child is free to work and play alone or to enter into a group situation when he is ready and able. He is free to ask a teacher and/or teacher's aide to read to him, or ask questions. Materials and/or activities are planned to stimulate activity and curiosity. Teachers constantly ask the children questions spurring them on to more inquiry and more use of language--the adult and the child inquire together. There might be (and often is) occasion for the teacher or the aide to take a child or a small group of children on a short walk to find the answer to a question that has arisen--what is that noise? Maybe it is a noise from construction down the block. Upon return from this short walk (or a field trip) there is a follow-up in the form of questions and answers, reading books and seeing pictures and role-play during which the children play adult roles of construction workers earning a living and helping their friends.

Such spontaneous activities are unlimited and can include seeing firemen put out a fire, birds building a nest, leaves growing on or falling from trees, a hamster giving birth to babies and so on. Therefore, the multi-choice period goes rapidly for adults and children with much comfortable but deliberate conversation and language development with freedom. The child is free to participate in activities in which he is comfortable (and the freedom not to participate at all if he is not ready) to move from one media and/or activity to another, to be himself within reasonable limits and to build an ever-increasing positive self-concept.

Perceptual motor exercises are next and 10 minutes is usually enough for teachers and children. They are formal exercises--the RCAF or Kephart exercises. This is to develop body awareness and coordination, temporal spatial orientation, and a general sense of well being. These exercises can vary in the form of pretending to be animals and movements to music or dancing to rhythms or square dancing when the children are coordinated enough to be fairly successful (we avoid activities resulting in lack of feelings of success). There are many ways. The vigorous exercise, however, is a must.

Thirty minutes is then spent in cooperative putting away and cleaning up, bathrooming, snacks and rest. The children learn to feel responsible and constructive in being able to help with "their school", seeing that it is neat, clean and things put where they belong. They learn health habits of toileting, food and rest. For snack time the children assume responsibility for passing juice, crackers and napkins, and placing discarded items in a waste basket after they have finished eating. During snack time the teacher encourages conversation, often by asking questions such as, "Jane, what did you see on the way to school today?"--or--having the children take turns telling stories. This, of course, teaches the children listening skills as well as language. The children then rest while listening to a story or music. Again, they learn to listen and lie as still as a four-year old can. This takes practice and time. The children then fold and replace their rest towels.

Programmed motivational activities include pre-academic areas such as mathematics, science and social studies. The mathematics, for instance, might take the form of games involving the use of a large box in which the children are in, behind, beside, above, etc.

It can be seeing what half or one-third of an apple is with the use of real or model fruit. It can be colored paper cut in shapes of circles, squares and so on. The children name the color, the form and count the pieces--two halves make one whole.

Science might be something to do with gravity (gravel as one child called it) or why something floats and another object does not and why. The children learn about their neighborhoods through field trips, stories and role-play. At the same time, they are learning their addresses, phone numbers, safety and city helpers. Their foundation for the social sciences is beginning.

Music and art can be taught more directly or formally during programmed motivational activity time. The children might listen to a record and identify a musical instrument. The teacher or a volunteer might bring this instrument to class and play it to give the children a first hand exposure and even an opportunity to make the sounds on the instrument.

The last 15 minutes are spent outdoors (waiting for the bus or parents) or if cold or wet, inside listening to a story and telling their own stories. They are involved in learning experiences right up to the time they leave the pre-school situation.

Throughout the above schedule, four areas of emphasis are in the minds of the teachers. These are:

1. Self-image
2. Language
3. Social-emotional development
4. Pre-academic concepts

The actual activities depend upon the teacher's careful planning and carrying out the (1) diagnosis of individual children and the group (2) establishing realistic goals (3) setting up activities that promote growth toward these goals.

Many more things can and are done in these preschool sessions. The above is an effort to mention only a few. However, the key is to have a teacher sensitive and creative enough to put her theory and training into a dynamically educational experience for the children. This involves considerable flexibility of personnel and schedule so content can come (to a great extent) from the children and thus be more meaningful and better learned toward the broader, firmer base of education on which is built all future education.

## RESULTS AND DISCUSSION

### Intelligence

The comparisons between the pre- and post-test intelligence quotients are contained in Table 1. These comparisons show that the mean IQ change of 7.32 was significant

TABLE 1

Pre- and Post-Test Comparisons of Stanford-Binet, L-M, 1960 Revision: Intelligence Quotients

| | Pre-Test | | Post-Test | | "t" | "r" |
|---|---|---|---|---|---|---|
| IQ | $\bar{X}$ | 88.54 | $\bar{X}$ | 95.89 | 4.28 | .59 |
| | S.D. | 13.50 | S.D. | 14.47 | | |

N=138

The pre- and post-test correlation of .59 indicates acceptable consistency between the two administrations over a period of approximately seven months.

As can be noted in Table 2, there is considerable change in the frequency distributions. In the initial testing, 25.4 per cent of the subjects attained an IQ of 79 or less, whereas the post-test distribution shows only 10.9

## TABLE 2

## Pre- and Post-Test Frequency Distributions of Stanford-Binet, L-M, 1960 Revision

| Pre-Test | | | | Post-Test | | | |
|---|---|---|---|---|---|---|---|
| Score | Freq. | Pct. | Cum. Pct. | Score | Freq. | Pct. | Cum. Pct. |
| 58 | 2 | 1.4 | 1.4 | 61 | 1 | 0.7 | 0.7 |
| 59 | 1 | 0.7 | 2.2 | 64 | 1 | 0.7 | 1.4 |
| 60 | 1 | 0.7 | 2.9 | 69 | 1 | 0.7 | 2.2 |
| 62 | 1 | 0.7 | 3.6 | 70 | 1 | 0.7 | 2.9 |
| 64 | 1 | 0.7 | 4.3 | 72 | 2 | 1.4 | 4.3 |
| 66 | 2 | 1.4 | 5.8 | 74 | 2 | 1.4 | 5.8 |
| 69 | 2 | 1.4 | 7.2 | 75 | 2 | 1.4 | 7.2 |
| 70 | 2 | 1.4 | 8.7 | 76 | 1 | 0.7 | 8.0 |
| 71 | 3 | 2.2 | 10.9 | 78 | 1 | 0.7 | 8.7 |
| 72 | 2 | 1.4 | 12.3 | 79 | 3 | 2.2 | 10.9 |
| 73 | 6 | 4.3 | 16.7 | 80 | 1 | 0.7 | 11.6 |
| 75 | 7 | 5.1 | 21.7 | 82 | 2 | 1.4 | 13.0 |
| 76 | 2 | 1.4 | 23.2 | 83 | 3 | 2.2 | 15.2 |
| 77 | 2 | 1.4 | 24.6 | 84 | 6 | 4.3 | 19.6 |
| 79 | 1 | 0.7 | 25.4 | 85 | 1 | 0.7 | 20.3 |
| 80 | 3 | 2.2 | 27.5 | 86 | 3 | 2.2 | 22.5 |
| 81 | 3 | 2.2 | 29.7 | 87 | 7 | 5.1 | 27.5 |
| 82 | 3 | 2.2 | 31.9 | 88 | 7 | 5.1 | 32.6 |
| 83 | 1 | 0.7 | 32.6 | 89 | 4 | 2.9 | 35.5 |
| 84 | 4 | 2.9 | 35.5 | 90 | 5 | 3.6 | 39.1 |
| 85 | 6 | 4.3 | 39.9 | 91 | 4 | 2.9 | 42.0 |
| 86 | 5 | 3.6 | 43.5 | 92 | 5 | 3.6 | 45.7 |
| 87 | 7 | 5.1 | 48.6 | 93 | 2 | 1.4 | 47.1 |
| 88 | 3 | 2.2 | 50.7 | 94 | 4 | 2.9 | 50.0 |
| 89 | 4 | 2.9 | 53.6 | 95 | 3 | 2.2 | 52.2 |
| 91 | 7 | 5.1 | 58.7 | 96 | 6 | 4.3 | 56.5 |
| 92 | 2 | 1.4 | 60.1 | 97 | 5 | 3.6 | 60.1 |
| 93 | 2 | 1.4 | 61.6 | 98 | 4 | 2.9 | 63.0 |
| 94 | 1 | 0.7 | 62.3 | 99 | 2 | 1.4 | 64.5 |
| 95 | 7 | 5.1 | 67.4 | 100 | 6 | 4.3 | 68.8 |
| 96 | 2 | 1.4 | 68.8 | 101 | 3 | 2.2 | 71.0 |
| 97 | 4 | 2.9 | 71.7 | 102 | 2 | 1.4 | 72.5 |
| 98 | 3 | 2.2 | 73.9 | 103 | 4 | 2.9 | 75.4 |
| 100 | 7 | 5.1 | 79.0 | 105 | 4 | 2.9 | 78.3 |
| 102 | 7 | 5.1 | 84.1 | 107 | 5 | 3.6 | 81.9 |
| 103 | 1 | 0.7 | 84.8 | 109 | 4 | 2.9 | 84.8 |
| 104 | 6 | 4.3 | 89.1 | 110 | 1 | 0.7 | 85.5 |
| 105 | 1 | 0.7 | 89.9 | 111 | 2 | 1.4 | 87.0 |
| 106 | 5 | 3.6 | 93.5 | 112 | 2 | 1.4 | 88.4 |
| 107 | 1 | 0.7 | 94.2 | 113 | 1 | 0.7 | 89.1 |
| 108 | 1 | 0.7 | 94.9 | 114 | 1 | 0.7 | 89.9 |
| 110 | 1 | 0.7 | 95.7 | 116 | 2 | 1.4 | 91.3 |
| 112 | 3 | 2.2 | 97.8 | 117 | 2 | 1.4 | 92.8 |
| 114 | 1 | 0.7 | 98.6 | 119 | 1 | 0.7 | 93.5 |
| 116 | 1 | 0.7 | 99.3 | 125 | 1 | 0.7 | 94.2 |
| 118 | 1 | 0.7 | 100.0 | 126 | 1 | 0.7 | 94.9 |
| | | | | 129 | 2 | 1.4 | 96.4 |
| | | | | 130 | 2 | 1.4 | 97.8 |
| | | | | 131 | 2 | 1.4 | 99.3 |
| | | | | 134 | 1 | 0.7 | 100.0 |

per cent in the same range. At the upper end of the distribution, only seven subjects, or 4.3 per cent of the population, had IQ's of 110 or above on the pre-test. The post-test distribution shows that twenty-one youngsters attained levels of 110 or above.

Tables 3 and 4 were constructed to assist in a further description of the characteristics of change. The pattern assesses the frequency distribution of youngsters attaining certain basal levels and the ceiling reached in relationship to that basal. To illustrate, in Table 3, four subjects obtained a two-year basal and the ceiling for these youngsters was III-6. The initial distribution shows that only 21 youngsters had basal levels of four years or above. The post-test tabulations indicates that over 75 youngsters reached the four-year level. It appears that the experiential background of the preschool program made a substantial contribution to these youngsters by providing them with opportunities to become acquainted with the "type" of task which samples areas of intellect which are commonly nurtured in middle- and upper-class environments. The upward movement of the tabulations in Tables 3 and 4 suggests that the developmental status of the youngsters was enhanced considerably, while the modest change in intelligence quotients minimizes the interpretation that the subjects increased in cognitive ability.

## TABLE 3

## Frequency Tabulation of the September Ceiling and Basal Levels for the Stanford-Binet

| Ceiling | II | II-6 | III | III-6 | IV | IV-6 | V | VI | VII | VIII |
|---|---|---|---|---|---|---|---|---|---|---|
| Basal II | | | | 4 | 1 | | 1 | | | |
| II-6 | | | | 2 | 11 | 3 | 8 | 8 | | |
| III | | | | | 4 | 7 | 9 | 24 | 5 | |
| III-6 | | | | | | 4 | 7 | 19 | 3 | |
| IV | | | | | | 2 | | 4 | 7 | 1 |
| IV-6 | | | | | | | | | 3 | 1 |
| V | | | | | | | | 2 | | 1 |
| VI | | | | | | | | | | |
| VII | | | | | | | | | | |
| VIII | | | | | | | | | | |

TABLE 4

## Frequency Tabulation of the May Ceiling and Basal Levels for the Stanford-Binet

| Ceiling | II | II-6 | III | III-6 | IV | IV-6 | V | VI | VII | VIII | IX |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Basal II | | | | | | 1 | | | | | |
| II-6 | | | | 1 | | | 2 | 2 | 1 | | |
| III | | | | | | 4 | 3 | 10 | 6 | 1 | |
| III-6 | | | | | | | 2 | 21 | 6 | 3 | |
| IV | | | | | | | 1 | 20 | 16 | 1 | 1 |
| IV-6 | | | | | | | 1 | 1 | 18 | 7 | 1 |
| V | | | | | | | | 1 | 7 | 1 | |
| VI | | | | | | | | | | 1 | 1 |
| VII | | | | | | | | | | | |
| VIII | | | | | | | | | | | |

## Psycholinguistics

The area of psycholinguistics, referred to in this investigation must be delineated in relationship to the assessment procedures utilized. The Illinois Test of Psycholinguistic Abilities (McCarthy and Kirk, 1961) assesses only those areas previously described and does not necessarily have more comprehensive implications for language ability. The ITPA is intended more as a diagnostic index than a developmental scale and its merits lie within the theoretical model from which it emerged and its use in individual evaluation.

Based upon an N of 136, which was the number of pre- and post-test pairs, the raw scores on all subtests were significantly greater in the final testing than they were in the initial testing, Table 5. The range of test-retest r's extends from a low of .24 for the visual-motor association test to a high of .65 for the auditory-vocal association test. The frequency distribution for these two subtests show considerable change in the number of subjects who received zero scores in the pre- and post-test evaluations. Eight subjects received zero scores on the auditory-vocal automatic pre-test, whereas only one received a zero score on the post-test. In contrast, there was a decrease of 16, from 19 to 3, in the number of subjects who received zero scores on the visual-motor association test. This pattern is noticeable in some of the remaining subtests and it may

## TABLE 5

### Pre- and Post-Test Comparisons of The Illinois Test of Psycholinguistic Abilities

| | Pre-Test | | Post-Test | | "t" | "r" |
|---|---|---|---|---|---|---|
| Auditory-Vocal Automatic Test | $\bar{X}$ | 3.95 | $\bar{X}$ | 5.21 | 3.91 | .52 |
| | S.D. | 2.25 | S.D. | 3.02 | | |
| Visual Decoding Test | $\bar{X}$ | 6.20 | $\bar{X}$ | 9.15 | 7.08 | .25 |
| | S.D. | 3.65 | S.D. | 3.50 | | |
| Motor Encoding Test | $\bar{X}$ | 7.76 | $\bar{X}$ | 10.01 | 5.27 | .51 |
| | S.D. | 3.44 | S.D. | 3.63 | | |
| Auditory-Vocal Association Test | X | 6.54 | X | 10.54 | 8.70 | .65 |
| | S.D. | 3.67 | S.D. | 3.98 | | |
| Visual-Motor Sequencing Test | $\bar{X}$ | 4.58 | $\bar{X}$ | 6.28 | 3.76 | .30 |
| | S.D. | 4.13 | S.D. | 3.94 | | |
| Vocal Encoding Test | $\bar{X}$ | 6.26 | $\bar{X}$ | 8.22 | 5.10 | .33 |
| | S.D. | 2.97 | S.D. | 3.24 | | |
| Auditory-Vocal Sequencing Test | $\bar{X}$ | 15.99 | $\bar{X}$ | 19.26 | 4.60 | .55 |
| | S.D. | 5.73 | S.D. | 5.98 | | |
| Visual-Motor Association Test | $\bar{X}$ | 6.28 | $\bar{X}$ | 11.74 | 9.58 | .24 |
| | S.D. | 4.70 | S.D. | 4.55 | | |
| Auditory Decoding Test | $\bar{X}$ | 10.47 | $\bar{X}$ | 13.91 | 4.79 | .34 |
| | S.D. | 6.20 | S.D. | 5.49 | | |

## TABLE 6

### Pre-and Post-Test Frequency Distributions of The Illinois Test of Psycholinguistic Abilities: Visual Decoding Test

| Pre-Test |  |  |  | Post-Test |  |  |  |
|---|---|---|---|---|---|---|---|
| Score | Freq. | Pct. | Cum. Pct. | Score | Freq. | Pct. | Cum. Pct. |
| -0 | 7 | 5.1 | 5.1 | 1 | 2 | 1.5 | 1.5 |
| 1 | 7 | 5.1 | 10.3 | 2 | 1 | 0.7 | 2.2 |
| 2 | 9 | 6.6 | 16.9 | 4 | 7 | 5.1 | 7.4 |
| 3 | 13 | 9.6 | 26.5 | 5 | 7 | 5.1 | 12.5 |
| 4 | 13 | 9.6 | 36.0 | 6 | 13 | 9.6 | 22.1 |
| 5 | 10 | 7.4 | 43.4 | 7 | 18 | 13.2 | 35.3 |
| 6 | 14 | 10.3 | 53.7 | 8 | 16 | 11.8 | 47.1 |
| 7 | 16 | 11.8 | 65.4 | 9 | 14 | 10.3 | 57.4 |
| 8 | 13 | 9.6 | 75.0 | 10 | 19 | 14.0 | 71.3 |
| 9 | 8 | 5.9 | 80.9 | 11 | 5 | 3.7 | 75.0 |
| 10 | 5 | 3.7 | 84.6 | 12 | 9 | 6.6 | 81.6 |
| 11 | 9 | 6.6 | 91.2 | 13 | 7 | 5.1 | 86.8 |
| 12 | 5 | 3.7 | 94.9 | 14 | 7 | 5.1 | 91.9 |
| 13 | 3 | 2.2 | 97.1 | 15 | 5 | 3.7 | 95.6 |
| 14 | 3 | 2.2 | 99.3 | 16 | 2 | 1.5 | 97.1 |
| 15 | 1 | 0.7 | 100.0 | 17 | 2 | 1.5 | 98.5 |
|  |  |  |  | 18 | 2 | 1.5 | 100.0 |

## TABLE 7

## Pre-and Post-Test Frequency Distributions of The Illinois Test of Psycholinguistic Abilities: Auditory-Vocal Automatic Test

| Pre-Test | | | | Post-Test | | | |
|---|---|---|---|---|---|---|---|
| Score | Freq. | Pct. | Cum. Pct. | Score | Freq. | Pct. | Cum. Pct. |
| -0 | 8 | 5.9 | 5.9 | -0 | 2 | 1.5 | 1.5 |
| 1 | 11 | 8.1 | 14.0 | 1 | 5 | 3.7 | 5.1 |
| 2 | 12 | 8.8 | 22.8 | 2 | 9 | 6.6 | 11.8 |
| 3 | 31 | 22.8 | 45.6 | 3 | 27 | 19.9 | 31.6 |
| 4 | 25 | 18.4 | 64.0 | 4 | 26 | 19.1 | 50.7 |
| 5 | 22 | 16.2 | 80.1 | 5 | 20 | 14.7 | 65.4 |
| 6 | 8 | 5.9 | 86.0 | 6 | 12 | 8.8 | 74.3 |
| 7 | 9 | 6.6 | 92.6 | 7 | 10 | 7.4 | 81.6 |
| 8 | 4 | 2.9 | 95.6 | 8 | 5 | 3.7 | 85.3 |
| 9 | 4 | 2.9 | 98.5 | 9 | 7 | 5.1 | 90.4 |
| 10 | 2 | 1.5 | 100.0 | 10 | 3 | 2.2 | 92.6 |
| | | | | 11 | 3 | 2.2 | 94.9 |
| | | | | 12 | 2 | 1.5 | 96.3 |
| | | | | 13 | 3 | 2.2 | 98.5 |
| | | | | 14 | 1 | 0.7 | 99.3 |
| | | | | 16 | 1 | 0.7 | 100.0 |

## TABLE 8

## Pre- and Post-Test Frequency Distributions of The Illinois Test of Psycholinguistic Abilities: Motor Encoding Test

| Pre-Test | | | | Post-Test | | | |
|---|---|---|---|---|---|---|---|
| Score | Freq. | Pct. | Cum. Pct. | Score | Freq. | Pct. | Cum. Pct. |
| -0 | 1 | 0.7 | 0.7 | 2 | 2 | 1.5 | 1.5 |
| 1 | 4 | 2.9 | 3.7 | 3 | 4 | 2.9 | 4.4 |
| 2 | 5 | 3.7 | 7.4 | 4 | 1 | 0.7 | 5.1 |
| 3 | 9 | 6.6 | 14.0 | 5 | 7 | 5.1 | 10.3 |
| 4 | 6 | 4.4 | 18.4 | 6 | 4 | 2.9 | 13.2 |
| 5 | 7 | 5.1 | 23.5 | 7 | 19 | 14.0 | 27.2 |
| 6 | 12 | 8.8 | 32.4 | 8 | 16 | 11.8 | 39.0 |
| 7 | 19 | 14.0 | 46.3 | 9 | 12 | 8.8 | 47.8 |
| 8 | 15 | 11.0 | 57.4 | 10 | 11 | 8.1 | 55.9 |
| 9 | 17 | 12.5 | 69.9 | 11 | 11 | 8.1 | 64.0 |
| 10 | 11 | 8.1 | 77.9 | 12 | 12 | 8.8 | 72.8 |
| 11 | 16 | 11.8 | 89.7 | 13 | 13 | 9.6 | 82.4 |
| 12 | 5 | 3.7 | 93.4 | 14 | 8 | 5.9 | 88.2 |
| 13 | 4 | 2.9 | 96.3 | 15 | 7 | 5.1 | 93.4 |
| 14 | 2 | 1.5 | 97.8 | 16 | 6 | 4.4 | 97.8 |
| 17 | 3 | 2.2 | 100.0 | 18 | 1 | 0.7 | 98.5 |
| | | | | 19 | 2 | 1.5 | 100.0 |

## TABLE 9

## Pre- and Post-Test Frequency Distributions of The Illinois Test of Psycholinguistic Abilities: Auditory-Vocal Association Test

| | Pre-Test | | | | Post-Test | | |
|---|---|---|---|---|---|---|---|
| **Score** | **Freq.** | **Pct.** | **Cum. Pct.** | **Score** | **Freq.** | **Pct.** | **Cum. Pct.** |
| -0 | 7 | 5.1 | 5.1 | -0 | 1 | 0.7 | 0.7 |
| 1 | 7 | 5.1 | 10.3 | 2 | 1 | 0.7 | 1.5 |
| 2 | 8 | 5.9 | 16.2 | 3 | 3 | 2.2 | 3.7 |
| 3 | 8 | 5.9 | 22.1 | 4 | 4 | 2.9 | 6.6 |
| 4 | 12 | 8.8 | 30.9 | 5 | 3 | 2.2 | 8.8 |
| 5 | 11 | 8.1 | 39.0 | 6 | 8 | 5.9 | 14.7 |
| 6 | 9 | 6.6 | 45.6 | 7 | 9 | 6.6 | 21.3 |
| 7 | 17 | 12.5 | 58.1 | 8 | 18 | 13.2 | 34.6 |
| 8 | 15 | 11.0 | 69.1 | 9 | 13 | 9.6 | 44.1 |
| 9 | 19 | 14.0 | 83.1 | 10 | 12 | 8.8 | 52.9 |
| 10 | 8 | 5.9 | 89.0 | 11 | 10 | 7.4 | 60.3 |
| 11 | 4 | 2.9 | 91.9 | 12 | 8 | 5.9 | 66.2 |
| 12 | 3 | 2.2 | 94.1 | 13 | 8 | 5.9 | 72.1 |
| 13 | 3 | 2.2 | 96.3 | 14 | 10 | 7.4 | 79.4 |
| 14 | 2 | 1.5 | 97.8 | 15 | 14 | 10.3 | 89.7 |
| 15 | 1 | 0.7 | 98.5 | 16 | 6 | 4.4 | 94.1 |
| 16 | 1 | 0.7 | 99.3 | 17 | 3 | 2.2 | 96.3 |
| 17 | 1 | 0.7 | 100.0 | 18 | 3 | 2.2 | 98.5 |
| | | | | 19 | 2 | 1.5 | 100.0 |

## TABLE 10

## Pre- and Post-Test Frequency Distributions of The Illinois Test of Psycholinguistic Abilities: Visual-Motor Sequencing Test

| Pre-Test | | | | Post-Test | | | |
|---|---|---|---|---|---|---|---|
| Score | Freq. | Pct. | Cum. Pct. | Score | Freq. | Pct. | Cum. Pct. |
| -0 | 37 | 27.2 | 27.2 | -0 | 15 | 11.0 | 11.0 |
| 1 | 6 | 4.4 | 31.6 | 1 | 3 | 2.2 | 13.2 |
| 2 | 10 | 7.4 | 39.0 | 2 | 13 | 9.6 | 22.8 |
| 3 | 7 | 5.1 | 44.1 | 3 | 3 | 2.2 | 25.0 |
| 4 | 13 | 9.6 | 53.7 | 4 | 13 | 9.6 | 34.6 |
| 5 | 7 | 5.1 | 58.8 | 5 | 8 | 5.9 | 40.4 |
| 6 | 12 | 8.8 | 67.6 | 6 | 13 | 9.6 | 50.0 |
| 7 | 11 | 8.1 | 75.7 | 7 | 15 | 11.0 | 61.0 |
| 8 | 10 | 7.4 | 83.1 | 8 | 15 | 11.0 | 72.1 |
| 9 | 5 | 3.7 | 86.8 | 9 | 10 | 7.4 | 79.4 |
| 10 | 5 | 3.7 | 90.4 | 10 | 8 | 5.9 | 85.3 |
| 11 | 3 | 2.2 | 92.6 | 11 | 2 | 1.5 | 86.8 |
| 12 | 5 | 3.7 | 96.3 | 12 | 11 | 8.1 | 94.9 |
| 13 | 2 | 1.5 | 97.8 | 13 | 3 | 2.2 | 97.1 |
| 14 | 2 | 1.5 | 99.3 | 14 | 2 | 1.5 | 98.5 |
| 18 | 1 | 0.7 | 100.0 | 15 | 2 | 1.5 | 100.0 |

## TABLE 11

## Pre- and Post-Test Frequency Distributions of The Illinois Test of Psycholinguistic Abilities: Vocal Encoding Test

| Pre-Test | | | | Post-Test | | | |
|---|---|---|---|---|---|---|---|
| Score | Freq. | Pct. | Cum. Pct. | Score | Freq. | Pct. | Cum. Pct. |
| -0 | 1 | 0.7 | 0.7 | -0 | 2 | 1.5 | 1.5 |
| 1 | 6 | 4.4 | 5.1 | 1 | 1 | 0.7 | 2.2 |
| 2 | 6 | 4.4 | 9.6 | 2 | 1 | 0.7 | 2.9 |
| 3 | 12 | 8.8 | 18.4 | 3 | 3 | 2.2 | 5.1 |
| 4 | 9 | 6.6 | 25.0 | 4 | 9 | 6.6 | 11.8 |
| 5 | 24 | 17.6 | 42.6 | 5 | 10 | 7.4 | 19.1 |
| 6 | 20 | 14.7 | 57.4 | 6 | 16 | 11.8 | 30.9 |
| 7 | 12 | 8.8 | 66.2 | 7 | 16 | 11.8 | 42.6 |
| 8 | 17 | 12.5 | 78.7 | 8 | 15 | 11.0 | 53.7 |
| 9 | 13 | 9.6 | 88.2 | 9 | 16 | 11.8 | 65.4 |
| 10 | 6 | 4.4 | 92.6 | 10 | 14 | 10.3 | 75.7 |
| 11 | 5 | 3.7 | 96.3 | 11 | 14 | 10.3 | 86.0 |
| 12 | 1 | 0.7 | 97.1 | 12 | 8 | 5.9 | 91.9 |
| 13 | 3 | 2.2 | 99.3 | 13 | 6 | 4.4 | 96.3 |
| 18 | 1 | 0.7 | 100.0 | 14 | 1 | 0.7 | 97.1 |
| | | | | 15 | 2 | 1.5 | 98.5 |
| | | | | 18 | 2 | 1.5 | 100.0 |

## TABLE 12

## Pre- and Post-Test Frequency Distributions of The Illinois Test of Psycholinguistic Abilities: Auditory-Vocal Sequencing Test

| | Pre-Test | | | | Post-Test | | |
|---|---|---|---|---|---|---|---|
| Score | Freq. | Pct. | Cum. Pct. | Score | Freq. | Pct. | Cum. Pct. |
| -0 | 1 | 0.7 | 0.7 | 5 | 1 | 0.7 | 0.7 |
| 1 | 1 | 0.7 | 1.5 | 7 | 1 | 0.7 | 1.5 |
| 2 | 1 | 0.7 | 2.2 | 8 | 1 | 0.7 | 2.2 |
| 3 | 1 | 0.7 | 2.9 | 9 | 1 | 0.7 | 2.9 |
| 4 | 1 | 0.7 | 3.7 | 10 | 2 | 1.5 | 4.4 |
| 6 | 2 | 1.5 | 5.1 | 11 | 2 | 1.5 | 5.9 |
| 7 | 2 | 1.5 | 6.6 | 12 | 2 | 1.5 | 7.4 |
| 9 | 4 | 2.9 | 9.6 | 13 | 3 | 2.2 | 9.6 |
| 10 | 5 | 3.7 | 13.2 | 14 | 12 | 8.8 | 18.4 |
| 11 | 8 | 5.9 | 19.1 | 15 | 6 | 4.4 | 22.8 |
| 12 | 10 | 7.4 | 26.5 | 16 | 17 | 12.5 | 35.3 |
| 13 | 9 | 6.6 | 33.1 | 17 | 6 | 4.4 | 39.7 |
| 14 | 7 | 5.1 | 38.2 | 18 | 12 | 8.8 | 48.5 |
| 15 | 6 | 4.4 | 42.6 | 19 | 16 | 11.8 | 60.3 |
| 16 | 8 | 5.9 | 48.5 | 20 | 14 | 10.3 | 70.6 |
| 17 | 17 | 12.5 | 61.0 | 21 | 6 | 4.4 | 75.0 |
| 18 | 11 | 8.1 | 69.1 | 22 | 5 | 3.7 | 78.7 |
| 19 | 13 | 9.6 | 78.7 | 23 | 5 | 3.7 | 82.4 |
| 20 | 8 | 5.9 | 84.6 | 24 | 1 | 0.7 | 83.1 |
| 21 | 6 | 4.4 | 89.0 | 25 | 3 | 2.2 | 85.3 |
| 22 | 5 | 3.7 | 92.6 | 26 | 4 | 2.9 | 88.2 |
| 24 | 1 | 0.7 | 93.4 | 27 | 1 | 0.7 | 89.0 |
| 25 | 2 | 1.5 | 94.9 | 28 | 4 | 2.9 | 91.9 |
| 26 | 1 | 0.7 | 95.6 | 29 | 4 | 2.9 | 94.9 |
| 27 | 1 | 0.7 | 96.3 | 30 | 1 | 0.7 | 95.6 |
| 28 | 1 | 0.7 | 97.1 | 31 | 1 | 0.7 | 96.3 |
| 29 | 1 | 0.7 | 97.8 | 34 | 1 | 0.7 | 97.1 |
| 32 | 2 | 1.5 | 99.3 | 35 | 1 | 0.7 | 97.8 |
| 33 | 1 | 0.7 | 100.0 | 37 | 1 | 0.7 | 98.5 |
| | | | | 38 | 1 | 0.7 | 99.3 |
| | | | | 40 | 1 | 0.7 | 100.0 |

## TABLE 13

## Pre- and Post-Test Frequency Distributions of The Illinois Test of Psycholinguistic Abilities: Visual-Motor Association Test

| Pre-Test | | | | Post-Test | | | |
|---|---|---|---|---|---|---|---|
| Score | Freq. | Pct. | Cum. Pct. | Score | Freq. | Pct. | Cum. Pct. |
| -0 | 19 | 14.0 | 14.0 | 1 | 3 | 2.2 | 2.2 |
| 1 | 18 | 13.2 | 27.2 | 2 | 4 | 2.9 | 5.1 |
| 2 | 3 | 2.2 | 29.4 | 3 | 1 | 0.7 | 5.9 |
| 3 | 5 | 3.7 | 33.1 | 4 | 2 | 1.5 | 7.4 |
| 4 | 5 | 3.7 | 36.8 | 6 | 7 | 5.1 | 12.5 |
| 5 | 10 | 7.4 | 44.1 | 7 | 3 | 2.2 | 14.7 |
| 6 | 8 | 5.9 | 50.0 | 8 | 13 | 9.6 | 24.3 |
| 7 | 10 | 7.4 | 57.4 | 9 | 9 | 6.6 | 30.9 |
| 8 | 9 | 6.6 | 64.0 | 10 | 8 | 5.9 | 36.8 |
| 9 | 14 | 10.3 | 74.3 | 11 | 13 | 9.6 | 46.3 |
| 10 | 10 | 7.4 | 81.6 | 12 | 14 | 10.3 | 56.6 |
| 11 | 7 | 5.1 | 86.8 | 13 | 11 | 8.1 | 64.7 |
| 12 | 4 | 2.9 | 89.7 | 14 | 10 | 7.4 | 72.1 |
| 13 | 5 | 3.7 | 93.4 | 15 | 5 | 3.7 | 75.7 |
| 14 | 3 | 2.2 | 95.6 | 16 | 7 | 5.1 | 80.9 |
| 15 | 1 | 0.7 | 96.3 | 17 | 13 | 9.6 | 90.4 |
| 16 | 4 | 2.9 | 99.3 | 18 | 5 | 3.7 | 94.1 |
| 18 | 1 | 0.7 | 100.0 | 19 | 5 | 3.7 | 97.8 |
| | | | | 20 | 3 | 2.2 | 100.0 |

## TABLE 14

## Pre- and Post-Test Frequency Distributions of The Illinois Test of Psycholinguistic Abilities: Auditory Decoding Test

| | Pre-Test | | | | Post-Test | | |
|---|---|---|---|---|---|---|---|
| **Score** | **Freq.** | **Pct.** | **Cum. Pct.** | **Score** | **Freq.** | **Pct.** | **Cum. Pct.** |
| -0 | 1 | 0.7 | 0.7 | 2 | 3 | 2.2 | 2.2 |
| 1 | 3 | 2.2 | 2.9 | 3 | 2 | 1.5 | 3.7 |
| 2 | 8 | 5.9 | 8.8 | 4 | 2 | 1.5 | 5.1 |
| 3 | 10 | 7.4 | 16.2 | 5 | 3 | 2.2 | 7.4 |
| 4 | 8 | 5.9 | 22.1 | 6 | 1 | 0.7 | 8.1 |
| 5 | 6 | 4.4 | 26.5 | 7 | 5 | 3.7 | 11.8 |
| 6 | 7 | 5.1 | 31.6 | 8 | 3 | 2.2 | 14.0 |
| 7 | 6 | 4.4 | 36.0 | 9 | 3 | 2.2 | 16.2 |
| 8 | 6 | 4.4 | 40.4 | 10 | 11 | 8.1 | 24.3 |
| 9 | 8 | 5.9 | 46.3 | 11 | 12 | 8.8 | 33.1 |
| 10 | 5 | 3.7 | 50.0 | 12 | 11 | 8.1 | 41.2 |
| 11 | 11 | 8.1 | 58.1 | 13 | 10 | 7.4 | 48.5 |
| 12 | 8 | 5.9 | 64.0 | 14 | 14 | 10.3 | 58.8 |
| 13 | 6 | 4.4 | 68.4 | 15 | 9 | 6.6 | 65.4 |
| 14 | 6 | 4.4 | 72.8 | 16 | 7 | 5.1 | 70.6 |
| 15 | 5 | 3.7 | 76.5 | 17 | 7 | 5.1 | 75.7 |
| 16 | 6 | 4.4 | 80.9 | 18 | 3 | 2.2 | 77.9 |
| 17 | 9 | 6.6 | 87.5 | 19 | 11 | 8.1 | 86.0 |
| 18 | 5 | 3.7 | 91.2 | 20 | 5 | 3.7 | 89.7 |
| 19 | 5 | 3.7 | 94.9 | 21 | 2 | 1.5 | 91.2 |
| 20 | 1 | 0.7 | 95.6 | 22 | 4 | 2.9 | 94.1 |
| 23 | 2 | 1.5 | 97.1 | 23 | 1 | 0.7 | 94.9 |
| 25 | 1 | 0.7 | 97.8 | 24 | 3 | 2.2 | 97.1 |
| 26 | 2 | 1.5 | 99.3 | 27 | 2 | 1.5 | 98.5 |
| 28 | 1 | 0.7 | 100.0 | 28 | 1 | 0.7 | 99.3 |
| | | | | 29 | 1 | 0.7 | 100.0 |

## TABLE 15

### Pre- and Post-Test Frequency Distributions of The Illinois Test of Psycholinguistic Abilities: Total Language Score

| Pre-Test | | | | Post-Test | | | |
|---|---|---|---|---|---|---|---|
| Score | Freq. | Pct. | Cum. Pct. | Score | Freq. | Pct. | Cum. Pct. |
| -0 | 1 | 0.7 | 0.7 | 44 | 1 | 0.7 | 0.7 |
| 16 | 1 | 0.7 | 1.5 | 45 | 1 | 0.7 | 1.5 |
| 18 | 1 | 0.7 | 2.2 | 48 | 1 | 0.7 | 2.2 |
| 23 | 1 | 0.7 | 2.9 | 56 | 2 | 1.5 | 3.7 |
| 24 | 1 | 0.7 | 3.7 | 59 | 1 | 0.7 | 4.4 |
| 26 | 1 | 0.7 | 4.4 | 60 | 1 | 0.7 | 5.1 |
| 27 | 1 | 0.7 | 5.1 | 61 | 1 | 0.7 | 5.9 |
| 30 | 2 | 1.5 | 6.6 | 62 | 2 | 1.5 | 7.4 |
| 32 | 3 | 2.2 | 8.8 | 65 | 1 | 0.7 | 8.1 |
| 34 | 2 | 1.5 | 10.3 | 66 | 3 | 2.2 | 10.3 |
| 37 | 1 | 0.7 | 11.0 | 68 | 3 | 2.2 | 12.5 |
| 39 | 2 | 1.5 | 12.5 | 69 | 1 | 0.7 | 13.2 |
| 40 | 1 | 0.7 | 13.2 | 70 | 2 | 1.5 | 14.7 |
| 41 | 3 | 2.2 | 15.4 | 71 | 1 | 0.7 | 15.4 |
| 43 | 1 | 0.7 | 16.2 | 72 | 3 | 2.2 | 17.6 |
| 44 | 3 | 2.2 | 18.4 | 74 | 4 | 2.9 | 20.6 |
| 50 | 2 | 1.5 | 19.9 | 75 | 2 | 1.5 | 22.1 |
| 51 | 1 | 0.7 | 20.6 | 76 | 2 | 1.5 | 23.5 |
| 52 | 1 | 0.7 | 21.3 | 77 | 3 | 2.2 | 25.7 |
| 53 | 3 | 2.2 | 23.5 | 78 | 3 | 2.2 | 27.9 |
| 54 | 3 | 2.2 | 25.7 | 79 | 1 | 0.7 | 28.7 |
| 55 | 3 | 2.2 | 27.9 | 80 | 1 | 0.7 | 29.4 |
| 58 | 3 | 2.2 | 30.1 | 81 | 1 | 0.7 | 30.1 |
| 60 | 2 | 1.5 | 31.6 | 82 | 2 | 1.5 | 31.6 |
| 62 | 2 | 1.5 | 33.1 | 83 | 1 | 0.7 | 32.4 |
| 63 | 2 | 1.5 | 34.6 | 84 | 2 | 1.5 | 33.8 |
| 64 | 4 | 2.9 | 37.5 | 86 | 1 | 0.7 | 34.6 |
| 66 | 4 | 2.9 | 40.4 | 87 | 1 | 0.7 | 35.3 |
| 67 | 2 | 1.5 | 41.9 | 88 | 4 | 2.9 | 38.2 |
| 68 | 1 | 0.7 | 42.6 | 89 | 3 | 2.2 | 40.4 |
| 69 | 4 | 2.9 | 45.6 | 90 | 1 | 0.7 | 41.2 |
| 70 | 4 | 2.9 | 48.5 | 91 | 3 | 2.2 | 43.4 |
| 71 | 4 | 2.9 | 51.5 | 92 | 4 | 2.9 | 46.3 |
| 72 | 2 | 1.5 | 52.9 | 93 | 1 | 0.7 | 47.1 |
| 73 | 2 | 1.5 | 54.4 | 94 | 4 | 2.9 | 50.0 |
| 74 | 2 | 1.5 | 55.9 | 95 | 2 | 1.5 | 51.5 |
| 75 | 4 | 2.9 | 58.8 | 96 | 2 | 1.5 | 52.9 |
| 76 | 3 | 2.2 | 61.0 | 97 | 3 | 2.2 | 55.1 |
| 77 | 1 | 0.7 | 61.8 | 98 | 2 | 1.5 | 56.6 |
| 78 | 6 | 4.4 | 66.2 | 99 | 3 | 2.2 | 58.8 |
| 79 | 3 | 2.2 | 68.4 | 100 | 3 | 2.2 | 61.0 |
| 81 | 2 | 1.5 | 69.9 | 101 | 2 | 1.5 | 62.5 |
| 82 | 5 | 3.7 | 73.5 | 102 | 1 | 0.7 | 63.2 |
| 83 | 3 | 2.2 | 75.7 | 103 | 4 | 2.9 | 66.2 |
| 84 | 1 | 0.7 | 76.5 | 104 | 2 | 1.5 | 67.6 |

TABLE 15
(Continued)

| Pre-Test | | | | Post-Test | | | |
|---|---|---|---|---|---|---|---|
| Score | Freq. | Pct. | Cum. Pct. | Score | Freq. | Pct. | Cum. Pct. |
| 85 | 1 | 0.7 | 77.2 | 106 | 1 | 0.7 | 68.4 |
| 86 | 2 | 1.5 | 78.7 | 107 | 2 | 1.5 | 69.9 |
| 87 | 2 | 1.5 | 80.1 | 109 | 1 | 0.7 | 70.6 |
| 88 | 3 | 2.2 | 82.4 | 110 | 4 | 2.9 | 73.5 |
| 89 | 1 | 0.7 | 83.1 | 111 | 1 | 0.7 | 74.3 |
| 90 | 2 | 1.5 | 84.6 | 112 | 2 | 1.5 | 75.7 |
| 91 | 1 | 0.7 | 85.3 | 113 | 2 | 1.5 | 77.2 |
| 92 | 1 | 0.7 | 86.0 | 114 | 7 | 5.1 | 82.4 |
| 94 | 1 | 0.7 | 86.8 | 116 | 1 | 0.7 | 83.1 |
| 95 | 3 | 2.2 | 89.0 | 117 | 1 | 0.7 | 83.8 |
| 96 | 1 | 0.7 | 89.7 | 118 | 2 | 1.5 | 85.3 |
| 97 | 2 | 1.5 | 91.2 | 119 | 1 | 0.7 | 86.0 |
| 98 | 1 | 0.7 | 91.9 | 120 | 1 | 0.7 | 86.8 |
| 100 | 2 | 1.5 | 93.4 | 121 | 2 | 1.5 | 88.2 |
| 101 | 3 | 2.2 | 95.6 | 123 | 1 | 0.7 | 89.0 |
| 102 | 1 | 0.7 | 96.3 | 124 | 3 | 2.2 | 91.2 |
| 103 | 2 | 1.5 | 97.8 | 125 | 2 | 1.5 | 92.6 |
| 105 | 1 | 0.7 | 98.5 | 126 | 1 | 0.7 | 93.4 |
| 111 | 1 | 0.7 | 99.3 | 127 | 2 | 1.5 | 94.9 |
| 118 | 1 | 0.7 | 100.0 | 132 | 1 | 0.7 | 95.6 |
| | | | | 134 | 3 | 2.2 | 97.8 |
| | | | | 135 | 1 | 0.7 | 98.5 |
| | | | | 141 | 1 | 0.7 | 99.3 |
| | | | | 157 | 1 | 0.7 | 100.0 |

be a factor which influenced the correlations.

The findings with the visual-motor sequencing test, Table 10, are highlighted by the fact that thirty-seven subjects failed to register a score on the initial test, whereas fifteen subjects failed to score in the post-test. The statistical manual for the ITPA (McCarthy and Kirk, 1963) cites a low test-retest coefficient for the visual-motor sequencing test. The ITPA data were obtained with six-and-a-half-year-old children, and the suggestion was made that this represents a poor sample for test-retest purposes because of the rapid change among children as they enter school. Possibly, the data obtained in the present investigation reflect a change resulting when four-year-old children enter school.

The cumulative percentages and the raw score equivalents for these percentages at pre- and post-test suggest a fair amount of group improvement in the course of the preschool program, particularly in total language performance. In almost every instance, the cumulative percentage of subjects receiving a given raw score was lower on the post-test than on the pre-test. To illustrate, 53.7 per cent of the youngsters received a raw score of 6 or below on the visual decoding pre-test. Only 22.1 per cent had corresponding scores in the post-test; an inverse pattern occurs at the opposite end of the scale.

Figure 1 contains the language age profiles for the pre- and post-testing; total language age changed from 3-8 to 4-7, an increase of eleven months. Within this there were increases of twenty-six months in the visual-motor association area and thirteen months in the visual decoding area. The auditory-vocal automatic and visual-motor sequencing areas were the only subtests in which the language age change failed to equal or exceed the chronological age growth of this population.

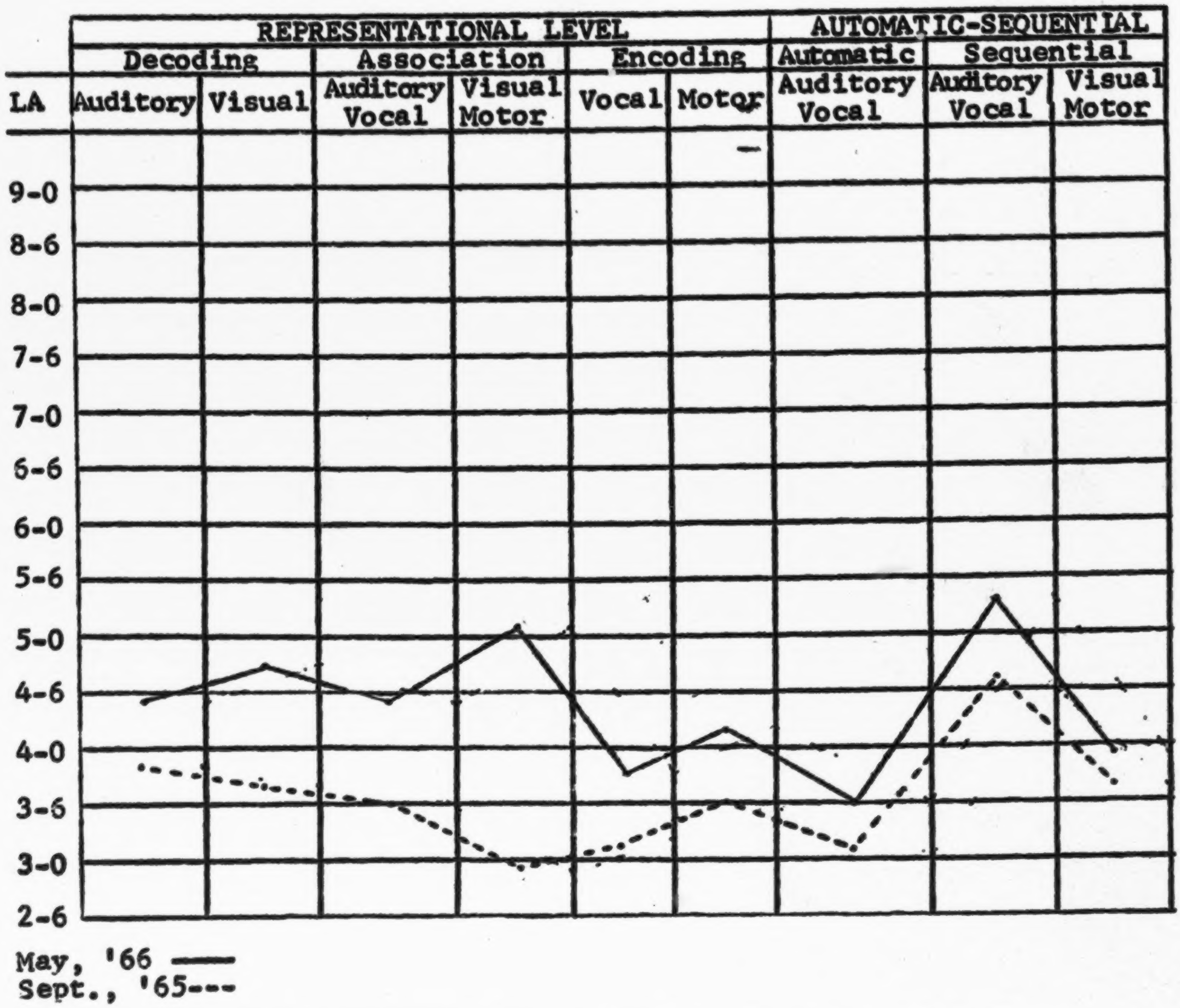
The principal investigator administered approximately seventy of the ITPA's, and his observations during the testing concur with the results. That is, the visual-motor sequencing test was extremely difficult for the subjects. The auditory-vocal automatic test frequently resulted in communication problems between the examiner and the subject. The youngsters, when confronted with the stimulus, "Here is a bed. Here are two _____," almost always said, "bed" instead of bed_s_. In item two, he responded with "hat," rather than "hats." The assessment of the grammatical rules being used by the child was hampered by the articulation and dialect of the child.

With the exception of the visual-motor association area, there does not appear to be any specific intervention in the profile. The over-all profile has moved upward and the areas of strength reflected in the initial testing continue as areas of strength after participation in the preschool program.

FIGURE 1

Pre- and Post-Test Language Age Comparisons on The Illinois Test of Psycholinguistic Abilities

| | Raw Score | | Language Age | |
|---|---|---|---|---|
| | **Pre** | **Post** | **Pre** | **Post** |
| Auditory-Vocal Automatic Test | 3.95 | 5.21 | 3- 1 | 3- 6 |
| Visual Decoding Test | 6.20 | 9.15 | 3- 8 | 4- 9 |
| Motor Encoding Test | 7.76 | 10.01 | 3- 6 | 4- 2 |
| Auditory-Vocal Association Test | 6.54 | 10.54 | 3- 6 | 4- 5 |
| Visual-Motor Sequencing Test | 4.58 | 6.28 | 3- 8 | 3-11 |
| Vocal Encoding Test | 6.26 | 8.22 | 3- 2 | 3-10 |
| Auditory-Vocal Sequencing Test | 15.99 | 19.26 | 4- 7 | 5- 4 |
| Visual-Motor Association Test | 6.28 | 11.74 | 2-11 | 5- 1 |
| Auditory Decoding Test | 10.47 | 13.91 | 3-10 | 4- 5 |
| ITPA Total | 68.52 | 94.75 | 3- 8 | 4- 7 |



Visual-motor association is described as the ability to relate to meaningful visual symbols. The noticeable improvement in this area could be highly related to the activity program of the preschool. Youngsters were observed handling toys, being instructed in the interpretation of pictorial stimuli and doing many things related to this category. The teachers did not have access to the tests, nor did they have any information about the performance of the children. It can be stated with confidence that there was very little specific diagnostic remediation attempted. Teacher observations provided the basis for any individual work that was undertaken. There is a fair probability that a comprehensive child development program was effective in combating the tendency toward disability even though it did not concentrate on specific procedures.

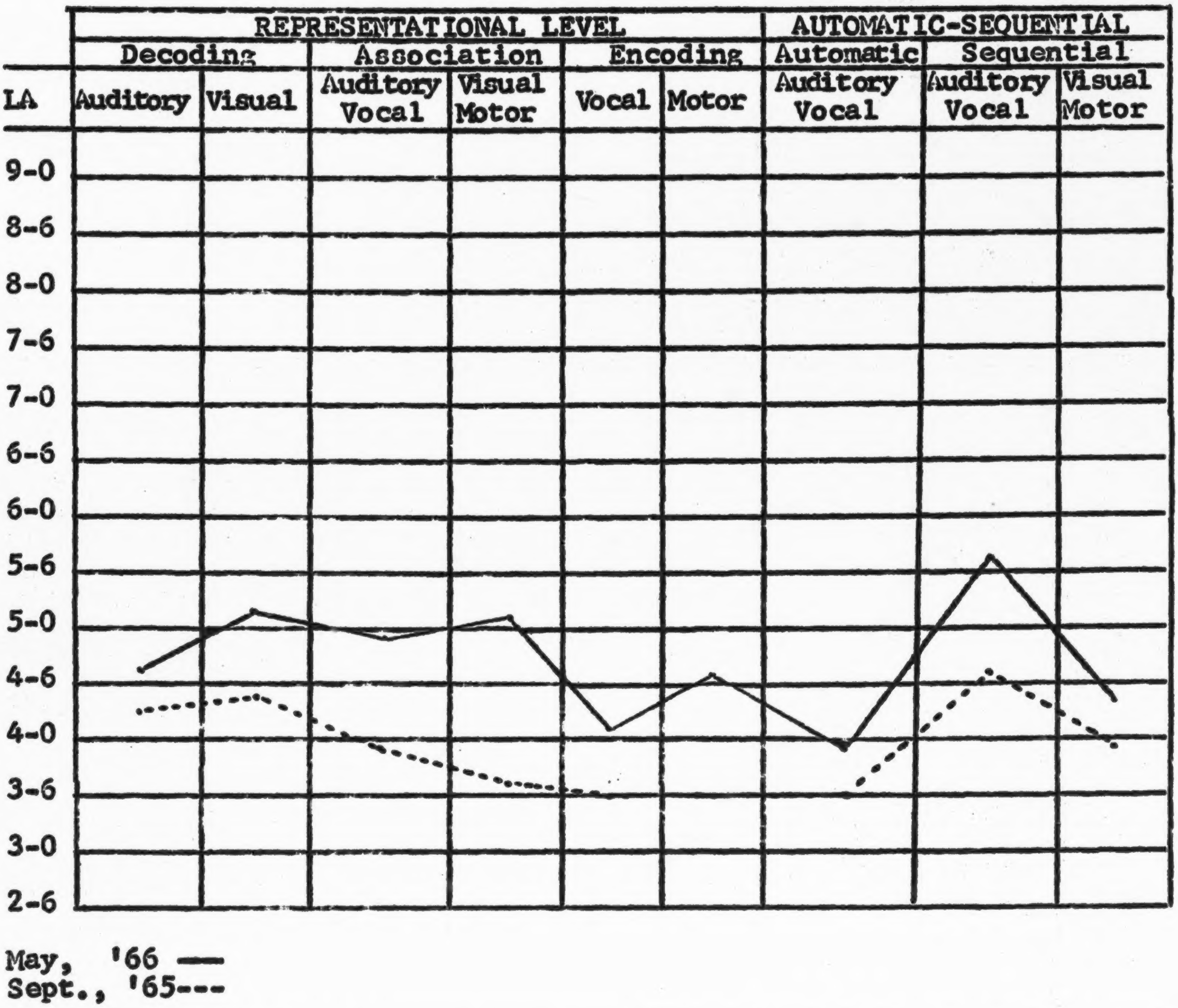
The post-test profile suggests that expressive language, grammatical style, (or its assessment in these children) and visual sequential memory are areas in which program emphasis might be directed.

Figures 2 through 4 contain pre- and post-test profiles of the three IQ groups. Each figure is divided into two parts, A and B. The "A" part depicts the pre- and post-test profiles derived from the language age, whereas the "B" section contains profiles which were prepared from the subtests' raw scores. The purpose of this procedure was to show norm and raw score changes. The three IQ samples were identified

## FIGURE 2A

### Pre- and Post-Test Language Age Comparisons on The Illinois Test of Psycholinguistic Abilities: High IQ Group (96-118)

| | Pre-Test | Post-Test |
|---|---|---|
| Auditory-Vocal Automatic Test | 3- 6 | 3-10 |
| Visual Decoding Test | 4- 5 | 5- 2 |
| Motor Encoding Test | 3- 6 | 4- 7 |
| Auditory-Vocal Association Test | 3-11 | 4-11 |
| Visual-Motor Sequencing Test | 3-11 | 4- 4 |
| Vocal Encoding Test | 3- 6 | 4- 1 |
| Auditory-Vocal Sequencing Test | 4- 7 | 5- 7 |
| Visual-Motor Association Test | 3- 8 | 5- 1 |
| Auditory Decoding Test | 4- 3 | 4- 7 |
| | | |
| ITPA Total | 4- 1 | 4- 9 |



## FIGURE 2B

**Pre-and Post-Test Raw Score Comparisons on The Illinois Test of Psycholinguistic Abilities: High IQ Group (96-118)**

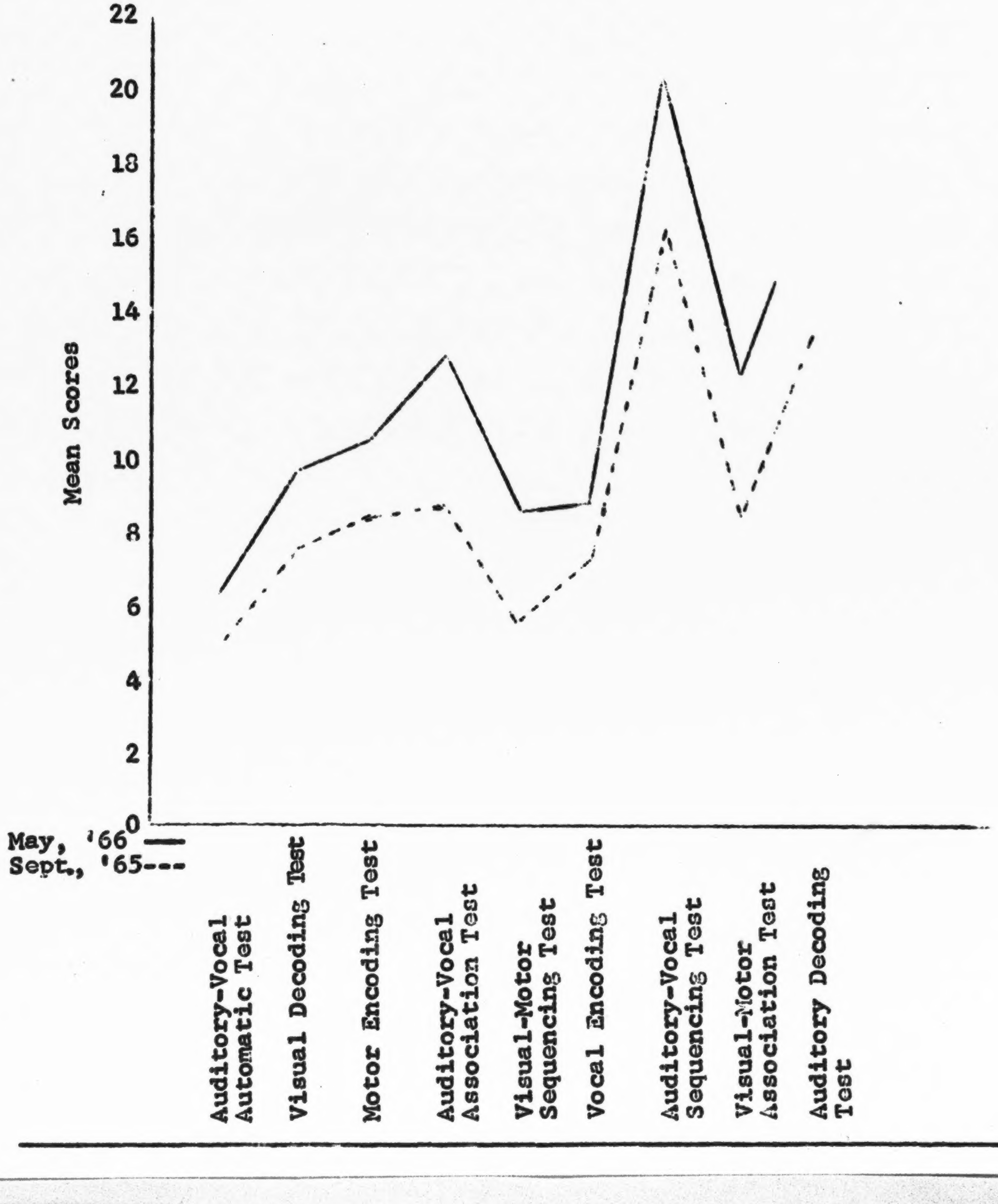
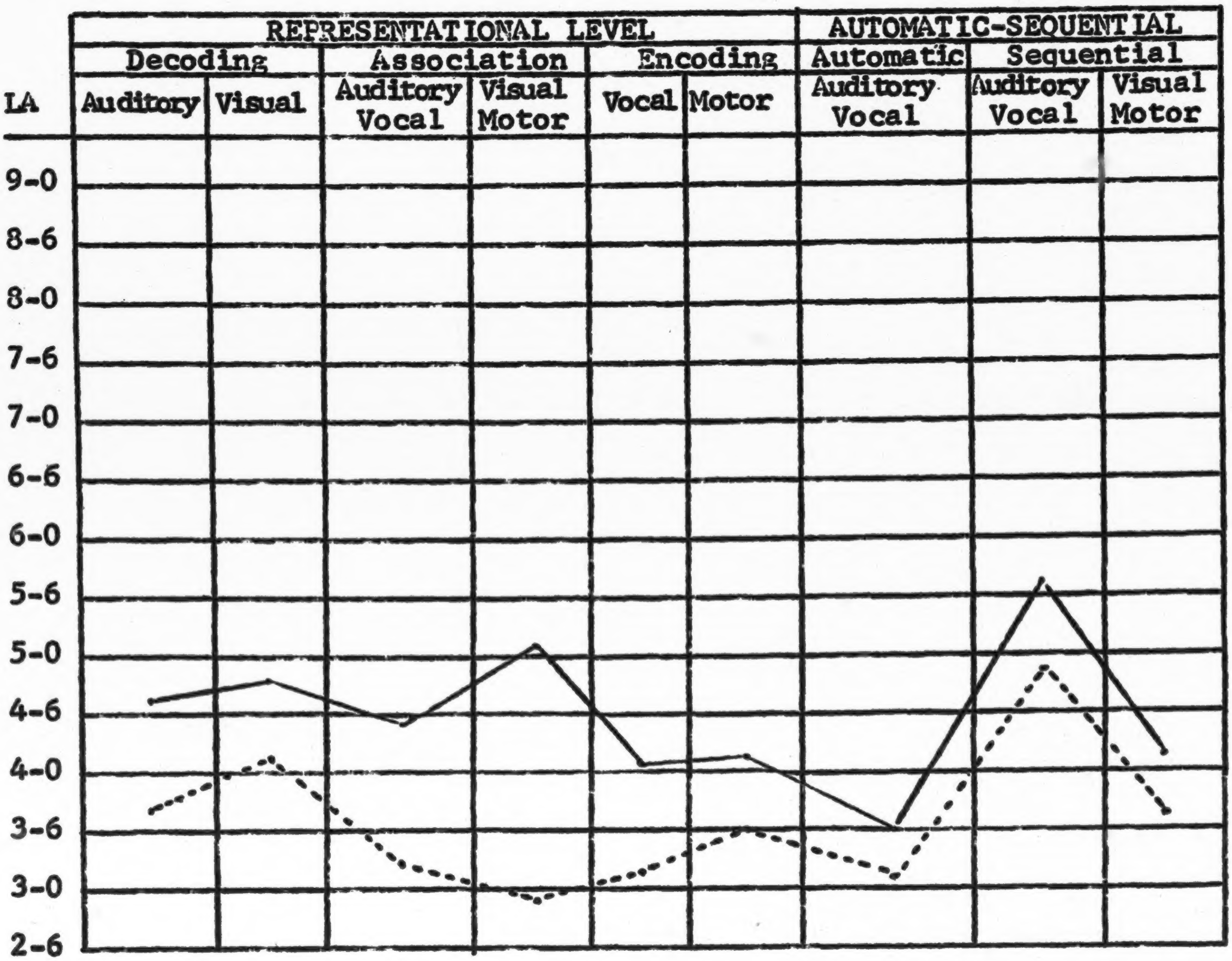


FIGURE 3A

**Pre- and Post-Test Language Age Comparisons on The Illinois Test of Psycholinguistic Abilities: Middle IQ Group (84-95)**

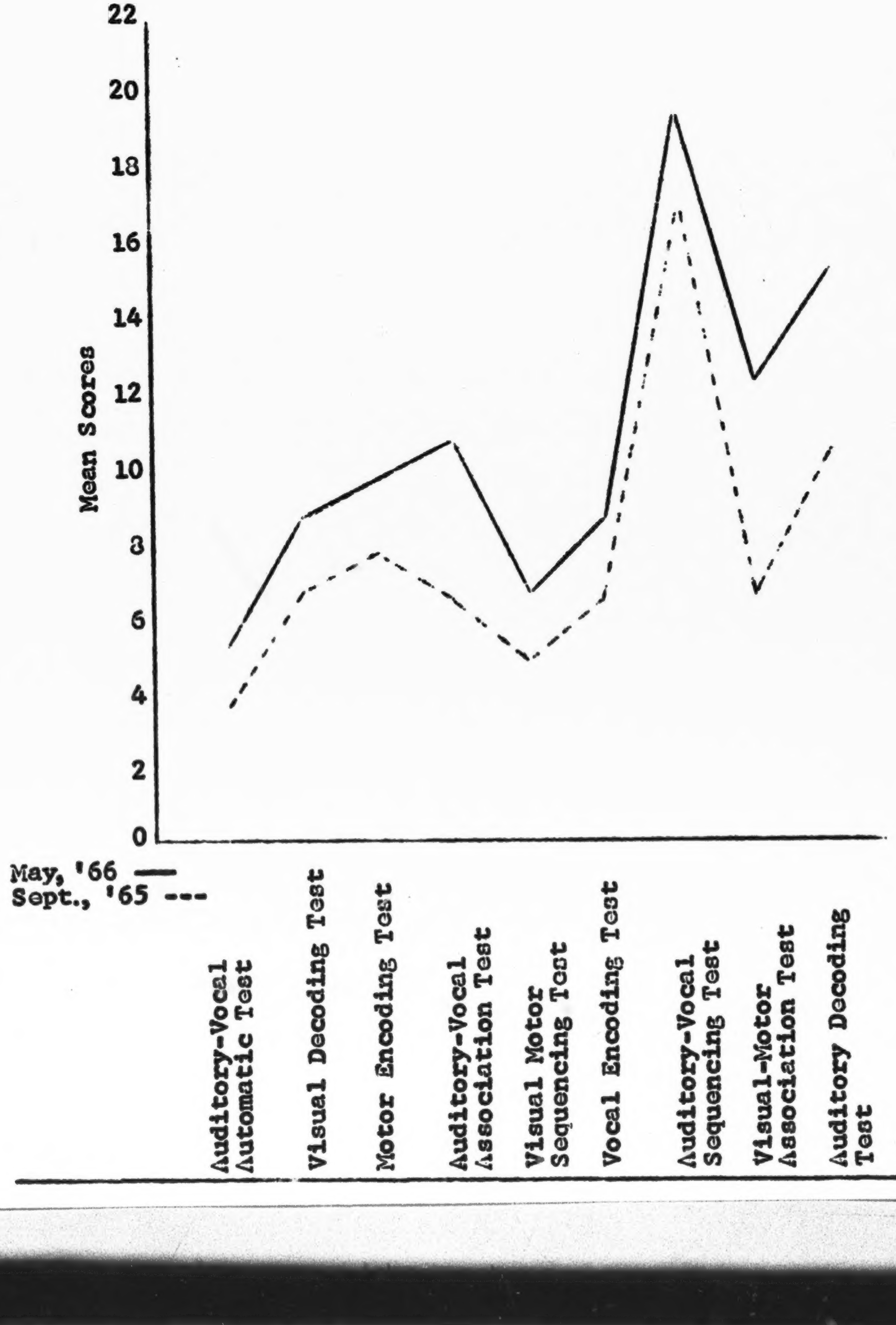
| | Pre-Test | Post-Test |
|---|---|---|
| Auditory-Vocal Automatic Test | 3- 1 | 3-6 |
| Visual Decoding Test | 4- 1 | 4-9 |
| Motor Encoding Test | 3- 6 | 4-2 |
| Auditory-Vocal Association Test | 3- 3 | 4-5 |
| Visual-Motor Sequencing Test | 3- 8 | 4-2 |
| Vocal Encoding Test | 3- 2 | 4-1 |
| Auditory-Vocal Sequencing Test | 4-10 | 5-7 |
| Visual-Motor Association Test | 2-11 | 5-1 |
| Auditory Decoding Test | 3- 8 | 4-7 |
| ITPA Total | 3- 8 | 4-6 |



May, '66——
Sept., '65---

FIGURE 3B

**Pre-and Post-Test Raw Score Comparisons on The Illinois Test of Psycholinguistic Abilities: Middle IQ Group (84-95)**



## FIGURE 4A

### Pre- and Post-Test Language Age Comparisons on The Illinois Test of Psycholinguistic Abilities: Low IQ Group (58-83)

| | Pre-Test | Post-Test |
|---|---|---|
| Auditory-Vocal Automatic Test | 2-9 | 3- 1 |
| Visual Decoding Test | 3-4 | 4- 9 |
| Motor Encoding Test | 3-2 | 4- 2 |
| Auditory-Vocal Association Test | 3-1 | 3- 8 |
| Visual-Motor Sequencing Test | 3-4 | 3- 8 |
| Vocal Encoding Test | 3-2 | 3- 6 |
| Auditory-Vocal Sequencing Test | 4-2 | 5- 4 |
| Visual-Motor Association Test | 2-3 | 4- 8 |
| Auditory Decoding Test | 3-2 | 3-10 |
| ITPA Total | 3-2 | 4- 1 |

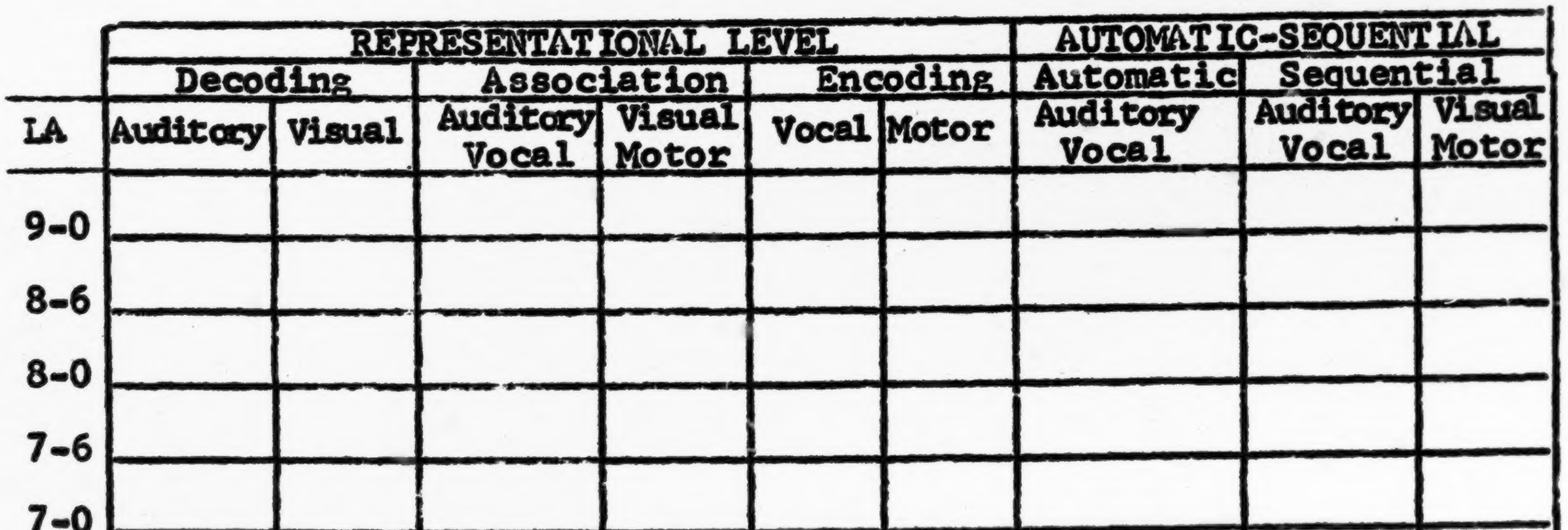
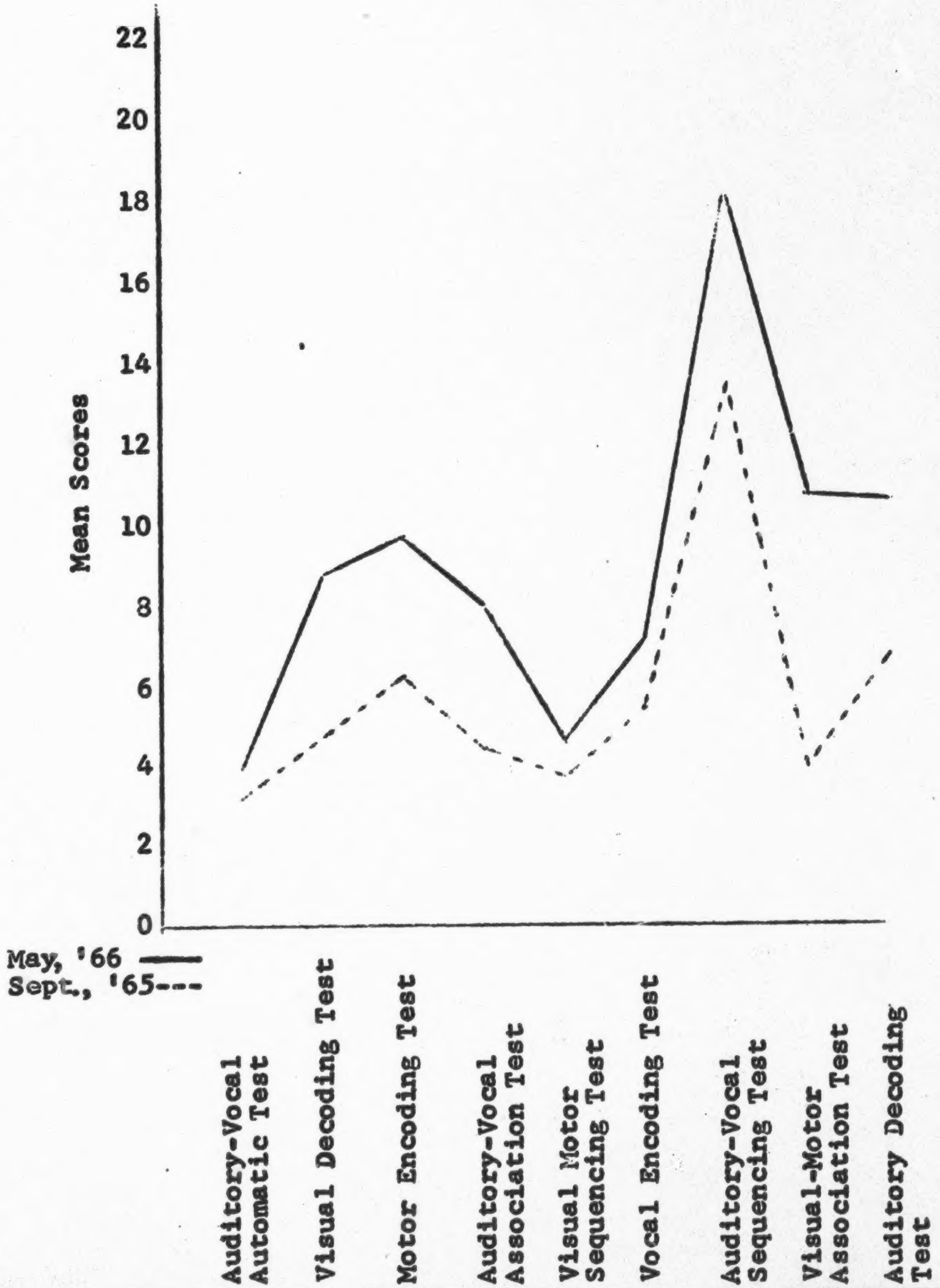


FIGURE 4B

Pre-and Post-Test Raw Score Comparisons on The Illinois Test of Psycholinguistic Abilities: Low IQ Group (58-83)



on a basis of the September IQ's and the figures contain the language age profiles based upon the original classification. The attention of the reader is directed to the fact that many of these youngsters were not members of the same IQ group during the post-testing. Therefore, the profile should be considered as informative and not definitive.

The High IQ Group showed a pre-test profile which was characterized by language age deficiencies in the encoding, auditory automatic and visual-motor association areas. The post-test comparison demonstrates considerable over-all improvement and a profile which resembles that of the chronological age of the sample. Vocal encoding and auditory-vocal automatic behavior continue to be deficits.

The profiles for the middle IQ sample identifies a deficit pattern in the association and encoding areas. With the exception of auditory vocal sequencing, subjects in this group are deficient in automatic-sequential behavior. The year-end profile shows considerable improvement in the association area, but the developmental deficiencies in encoding and auditory-vocal and visual-motor sequencing continue.

The language profiles of the low IQ group, which includes subjects with IQ's of 83 and below, are contained in Figures 4A and 4B. When viewed in relation to a chronological age of about 50 months, the pre-test pattern is characteristic of a serious developmental lag. With the exception of the ability to repeat digits, the psycholinguistic status of those subjects is substantially deficient. There is, however, evidence of considerable compensation in the profile. This is obvious in the visual decoding and visual-motor association areas. The post-test profiles show subtest gains in excess of one year in visual decoding, auditory vocal sequencing, and visual-motor association. The remaining six subtests continue to show deficiencies. The profile of the low IQ group is characterized by the identification of more specific strengths and weaknesses than the middle or high IQ groups.

## Learning Aptitude

Inasmuch as the Detroit Tests of Learning Aptitude are lacking in standardization data, particularly in concurrent and predictive validity and reliability, the confirmation of "learning aptitudes" among the present subjects is limited. There is, however, literature pertinent to the diagnostic and clinical aspects of selected subtest patterns (Cawley, n.d.). Six of the DTLA nineteen subtests were selected for use in the present study.

The raw score comparisons show that all post-test means are significantly greater than the corresponding pre-test means. With the exception of oral commissions, where the pre-test mean had a mental age equivalent of 5 years-6 months, the increase in raw score means nearly doubled or trebled the original score.

The test-retest correlations fail to attain magnitudes which permit unequivocal interpretation. As is noted in Table 16, the range extends from a low of .21 for oral commissions to a high of .45 in social adjustment, which requires an analysis of tasks in which the subject demonstrates his familiarity with civic affairs and common objects. One factor which undoubtedly influenced the data was the large number of youngsters who received zero scores on many of the subtests. The naivete of the children was apparent and certainly the issue of pretraining is a relevant one to raise. Tables 17 through 23 contain the frequency distributions of the DTLA subtests. On one test of social adjustment, Table 18, 72 pre-test subjects failed to respond correctly to a single item. In the post-test, 42, or 32.8 failed to receive a correct score. This test requires the subject to describe acceptable behavior in certain social situations such as, "What is the thing for you to do if someone wants you to throw stones at the windows of another person's house?" or "What is the thing to do if your radio disturbs someone else very much?" Although the response to these items were not always acceptable according to middle-class standards, they may be indicative of the social learning of the milieu of the child. Many subjects asserted that if other children were going to throw stones, it was appropriate for them to do it also.

## TABLE 16

## Pre- and Post-Test Comparisons of Detroit Tests of Learning Aptitude

| | Pre-Test | | Post-Test | | "t" | "r" |
|---|---|---|---|---|---|---|
| Motor Speed | $\bar{X}$ | 13.95 | $\bar{X}$ | 24.09 | 6.69 | .24 |
| | S.D. | 11.87 | S.D. | 12.80 | | |
| Oral Commissions | $\bar{X}$ | 9.38 | $\bar{X}$ | 14.38 | 9.90 | .21 |
| | S.D. | 4.91 | S.D. | 3.06 | | |
| Social Adjustment A | $\bar{X}$ | 2.67 | $\bar{X}$ | 7.80 | 5.35 | .24 |
| | S.D. | 4.25 | S.D. | 10.07 | | |
| Visual Attention Span for Objects, Simple Score | $\bar{X}$ | 12.48 | $\bar{X}$ | 22.84 | 11.08 | .23 |
| | S.D. | 8.62 | S.D. | 7.02 | | |
| Visual Attention Span for Objects, Weighted Score | $\bar{X}$ | 54.33 | $\bar{X}$ | 107.80 | 10.59 | .28 |
| | S.D. | 45.75 | S.D. | 38.32 | | |
| Orientation | $\bar{X}$ | 5.34 | $\bar{X}$ | 13.00 | 11.84 | .43 |
| | S.D. | 5.10 | S.D. | 5.43 | | |
| Social Adjustment B | $\bar{X}$ | 5.22 | $\bar{X}$ | 12.19 | 9.90 | .45 |
| | S.D. | 6.03 | S.D. | 5.46 | | |

## TABLE 17

### Pre- and Post-Test Frequency Distributions of Detroit Tests of Learning Aptitude: Oral Commissions

| Pre-Test | | | | Post-Test | | | |
|---|---|---|---|---|---|---|---|
| Score | Freq. | Pct. | Cum. Pct. | Score | Freq. | Pct. | Cum. Pct. |
| -0 | 11 | 8.2 | 8.2 | -0 | 1 | 0.7 | 0.7 |
| 1 | 1 | 0.7 | 9.0 | 8 | 4 | 3.0 | 3.7 |
| 2 | 1 | 0.7 | 9.7 | 9 | 3 | 2.2 | 6.0 |
| 3 | 4 | 3.0 | 12.7 | 10 | 7 | 5.2 | 11.2 |
| 4 | 10 | 7.5 | 20.1 | 11 | 7 | 5.2 | 16.4 |
| 5 | 5 | 3.7 | 23.9 | 12 | 8 | 6.0 | 22.4 |
| 6 | 5 | 3.7 | 27.6 | 13 | 15 | 11.2 | 33.6 |
| 7 | 8 | 6.0 | 33.6 | 14 | 16 | 11.9 | 45.5 |
| 8 | 8 | 6.0 | 39.6 | 15 | 22 | 16.4 | 61.9 |
| 9 | 8 | 6.0 | 45.5 | 16 | 23 | 17.2 | 79.1 |
| 10 | 12 | 9.0 | 54.5 | 17 | 9 | 6.7 | 85.8 |
| 11 | 9 | 6.7 | 61.2 | 18 | 7 | 5.2 | 91.0 |
| 12 | 15 | 11.2 | 72.4 | 19 | 11 | 8.2 | 99.3 |
| 13 | 8 | 6.0 | 78.4 | 20 | 1 | 0.7 | 100.0 |
| 14 | 11 | 8.2 | 86.6 | | | | |
| 15 | 4 | 3.0 | 89.6 | | | | |
| 16 | 4 | 3.0 | 92.5 | | | | |
| 17 | 8 | 6.0 | 98.5 | | | | |
| 19 | 2 | 1.5 | 100.0 | | | | |

## TABLE 18

## Pre- and Post-Test Frequency Distributions of Detroit Tests of Learning Aptitude: Social Adjustment A

| Pre-Test | | | | Post-Test | | | |
|---|---|---|---|---|---|---|---|
| Score | Freq. | Pct. | Cum. Pct. | Score | Freq. | Pct. | Cum. Pct. |
| -0 | 72 | 53.7 | 53.7 | -0 | 44 | 32.8 | 32.8 |
| 1 | 3 | 2.2 | 56.0 | 1 | 8 | 6.0 | 38.8 |
| 2 | 5 | 3.7 | 59.7 | 2 | 4 | 3.0 | 41.8 |
| 3 | 21 | 15.7 | 75.4 | 3 | 10 | 7.5 | 49.3 |
| 4 | 5 | 3.7 | 79.1 | 4 | 6 | 4.5 | 53.7 |
| 5 | 7 | 5.2 | 84.3 | 5 | 7 | 5.2 | 59.0 |
| 6 | 3 | 2.2 | 86.6 | 6 | 5 | 3.7 | 62.7 |
| 8 | 4 | 3.0 | 89.6 | 7 | 3 | 2.2 | 64.9 |
| 9 | 6 | 4.5 | 94.0 | 8 | 4 | 3.0 | 67.9 |
| 10 | 1 | 0.7 | 94.8 | 9 | 1 | 0.7 | 68.7 |
| 11 | 1 | 0.7 | 95.5 | 10 | 4 | 3.0 | 71.6 |
| 12 | 1 | 0.7 | 96.3 | 11 | 4 | 3.0 | 74.6 |
| 15 | 1 | 0.7 | 97.0 | 12 | 1 | 0.7 | 75.4 |
| 16 | 2 | 1.5 | 98.5 | 13 | 6 | 4.5 | 79.9 |
| 21 | 1 | 0.7 | 99.3 | 15 | 3 | 2.2 | 82.1 |
| 22 | 1 | 0.7 | 100.0 | 16 | 2 | 1.5 | 83.6 |
| | | | | 18 | 3 | 2.2 | 85.8 |
| | | | | 20 | 1 | 0.7 | 86.6 |
| | | | | 21 | 1 | 0.7 | 87.3 |
| | | | | 23 | 2 | 1.5 | 88.8 |
| | | | | 24 | 3 | 2.2 | 91.0 |
| | | | | 25 | 2 | 1.5 | 92.5 |
| | | | | 28 | 3 | 2.2 | 94.8 |
| | | | | 30 | 1 | 0.7 | 95.5 |
| | | | | 32 | 1 | 0.7 | 96.3 |
| | | | | 33 | 1 | 0.7 | 97.0 |
| | | | | 34 | 1 | 0.7 | 97.8 |
| | | | | 39 | 1 | 0.7 | 98.5 |
| | | | | 41 | 2 | 1.5 | 100.0 |

### TABLE 19

### Pre-and Post-Test Frequency Distributions of Detroit Tests of Learning Aptitude: Visual Attention Span for Objects, Simple Score

| Pre-Test | | | | Post-Test | | | |
|---|---|---|---|---|---|---|---|
| Score | Freq. | Pct. | Cum. Pct. | Score | Freq. | Pct. | Cum. Pct. |
| -0 | 10 | 7.5 | 7.5 | -0 | 1 | 0.7 | 0.7 |
| 1 | 3 | 2.2 | 9.7 | 2 | 1 | 0.7 | 1.5 |
| 2 | 5 | 3.7 | 13.4 | 5 | 1 | 0.7 | 2.2 |
| 3 | 4 | 3.0 | 16.4 | 7 | 1 | 0.7 | 3.0 |
| 4 | 4 | 3.0 | 19.4 | 8 | 1 | 0.7 | 3.7 |
| 5 | 4 | 3.0 | 22.4 | 9 | 2 | 1.5 | 5.2 |
| 6 | 8 | 6.0 | 28.4 | 13 | 3 | 2.2 | 7.5 |
| 7 | 9 | 6.7 | 35.1 | 14 | 3 | 2.2 | 9.7 |
| 8 | 4 | 3.0 | 38.1 | 15 | 6 | 4.5 | 14.2 |
| 9 | 4 | 3.0 | 41.0 | 16 | 3 | 2.2 | 16.4 |
| 10 | 9 | 6.7 | 47.8 | 17 | 5 | 3.7 | 20.1 |
| 11 | 4 | 3.0 | 50.7 | 18 | 2 | 1.5 | 21.6 |
| 12 | 6 | 4.5 | 55.2 | 19 | 10 | 7.5 | 29.1 |
| 13 | 3 | 2.2 | 57.5 | 20 | 7 | 5.2 | 34.3 |
| 14 | 5 | 3.7 | 61.2 | 21 | 6 | 4.5 | 38.8 |
| 15 | 5 | 3.7 | 64.9 | 22 | 9 | 6.7 | 45.5 |
| 16 | 2 | 1.5 | 66.4 | 23 | 12 | 9.0 | 54.5 |
| 17 | 7 | 5.2 | 71.6 | 24 | 7 | 5.2 | 59.7 |
| 18 | 4 | 3.0 | 74.6 | 25 | 7 | 5.2 | 64.9 |
| 19 | 2 | 1.5 | 76.1 | 26 | 5 | 3.7 | 68.7 |
| 20 | 7 | 5.2 | 81.3 | 27 | 5 | 3.7 | 72.4 |
| 21 | 5 | 3.7 | 85.1 | 28 | 9 | 6.7 | 79.1 |
| 22 | 3 | 2.2 | 87.3 | 29 | 8 | 6.0 | 85.1 |
| 23 | 2 | 1.5 | 88.8 | 30 | 2 | 1.5 | 86.6 |
| 24 | 3 | 2.2 | 91.0 | 31 | 6 | 4.5 | 91.0 |
| 25 | 3 | 2.2 | 93.3 | 32 | 3 | 2.2 | 93.3 |
| 26 | 1 | 0.7 | 94.0 | 33 | 2 | 1.5 | 94.8 |
| 27 | 1 | 0.7 | 94.8 | 34 | 3 | 2.2 | 97.0 |
| 29 | 1 | 0.7 | 95.5 | 35 | 1 | 0.7 | 97.8 |
| 30 | 1 | 0.7 | 96.3 | 36 | 1 | 0.7 | 98.5 |
| 31 | 1 | 0.7 | 97.0 | 39 | 2 | 1.5 | 100.0 |
| 32 | 2 | 1.5 | 98.5 | | | | |
| 34 | 1 | 0.7 | 99.3 | | | | |
| 36 | 1 | 0.7 | 100.0 | | | | |

## TABLE 20

## Pre-and Post-Test Frequency Distributions of Detroit Tests of Learning Aptitude: Visual Attention Span for Objects, Weighted Score

| Pre-Test | | | | Post-Test | | | |
|---|---|---|---|---|---|---|---|
| Score | Freq. | Pct. | Cum. Pct. | Score | Freq. | Pct. | Cum. Pct. |
| -0 | 10 | 7.5 | 7.5 | 10 | 1 | 0.7 | 0.7 |
| 2 | 2 | 1.5 | 9.0 | 12 | 1 | 0.7 | 1.5 |
| 3 | 1 | 0.7 | 9.7 | 22 | 1 | 0.7 | 2.2 |
| 4 | 1 | 0.7 | 10.4 | 38 | 1 | 0.7 | 3.0 |
| 5 | 4 | 3.0 | 13.4 | 42 | 1 | 0.7 | 3.7 |
| 6 | 1 | 0.7 | 14.2 | 44 | 1 | 0.7 | 4.5 |
| 7 | 2 | 1.5 | 15.7 | 46 | 1 | 0.7 | 5.2 |
| 9 | 2 | 1.5 | 17.2 | 49 | 1 | 0.7 | 6.0 |
| 10 | 2 | 1.5 | 18.7 | 54 | 1 | 0.7 | 6.7 |
| 11 | 1 | 0.7 | 19.4 | 58 | 3 | 2.2 | 9.0 |
| 12 | 2 | 1.5 | 20.9 | 59 | 1 | 0.7 | 9.7 |
| 13 | 1 | 0.7 | 21.6 | 63 | 2 | 1.5 | 11.2 |
| 15 | 2 | 1.5 | 23.1 | 64 | 1 | 0.7 | 11.9 |
| 16 | 1 | 0.7 | 23.9 | 66 | 1 | 0.7 | 12.7 |
| 17 | 2 | 1.5 | 25.4 | 69 | 1 | 0.7 | 13.4 |
| 18 | 2 | 1.5 | 26.9 | 70 | 1 | 0.7 | 14.2 |
| 20 | 4 | 3.0 | 29.9 | 71 | 1 | 0.7 | 14.9 |
| 21 | 2 | 1.5 | 31.3 | 72 | 1 | 0.7 | 15.7 |
| 22 | 2 | 1.5 | 32.8 | 75 | 2 | 1.5 | 17.2 |
| 24 | 3 | 2.2 | 35.1 | 76 | 1 | 0.7 | 17.9 |
| 25 | 1 | 0.7 | 35.8 | 77 | 1 | 0.7 | 18.7 |
| 26 | 2 | 1.5 | 37.3 | 79 | 1 | 0.7 | 19.4 |
| 27 | 1 | 0.7 | 38.1 | 80 | 4 | 3.0 | 22.4 |
| 28 | 3 | 2.2 | 40.3 | 81 | 1 | 0.7 | 23.1 |
| 29 | 3 | 2.2 | 42.5 | 82 | 1 | 0.7 | 23.9 |
| 30 | 2 | 1.5 | 44.0 | 83 | 1 | 0.7 | 24.6 |
| 32 | 2 | 1.5 | 45.5 | 84 | 1 | 0.7 | 25.4 |
| 35 | 1 | 0.7 | 46.3 | 85 | 1 | 0.7 | 26.1 |
| 36 | 1 | 0.7 | 47.0 | 86 | 2 | 1.5 | 27.6 |
| 37 | 1 | 0.7 | 47.8 | 87 | 1 | 0.7 | 28.4 |
| 38 | 1 | 0.7 | 48.5 | 89 | 2 | 1.5 | 29.9 |
| 40 | 1 | 0.7 | 49.3 | 91 | 1 | 0.7 | 30.6 |
| 41 | 1 | 0.7 | 50.0 | 92 | 2 | 1.5 | 32.1 |
| 43 | 1 | 0.7 | 50.7 | 93 | 2 | 1.5 | 33.6 |
| 47 | 1 | 0.7 | 51.5 | 94 | 1 | 0.7 | 34.3 |
| 48 | 2 | 1.5 | 53.0 | 95 | 3 | 2.2 | 36.6 |
| 51 | 1 | 0.7 | 53.7 | 96 | 2 | 1.5 | 38.1 |
| 52 | 4 | 3.0 | 56.7 | 98 | 2 | 1.5 | 39.6 |
| 53 | 1 | 0.7 | 57.5 | 100 | 1 | 0.7 | 40.3 |
| 57 | 1 | 0.7 | 58.2 | 101 | 2 | 1.5 | 41.8 |
| 59 | 3 | 2.2 | 60.4 | 102 | 2 | 1.5 | 43.3 |
| 63 | 1 | 0.7 | 61.2 | 104 | 2 | 1.5 | 44.8 |
| 65 | 1 | 0.7 | 61.9 | 105 | 2 | 1.5 | 46.3 |
| 71 | 2 | 1.5 | 63.4 | 106 | 4 | 3.0 | 49.3 |
| 72 | 1 | 0.7 | 64.2 | 107 | 2 | 1.5 | 50.7 |

## TABLE 20
## (Continued)

| | Pre-Test | | | | Post-Test | | |
|---|---|---|---|---|---|---|---|
| Score | Freq. | Pct. | Cum. Pct. | Score | Freq. | Pct. | Cum. Pct. |
| 73 | 1 | 0.7 | 64.9 | 108 | 2 | 1.5 | 52.2 |
| 74 | 4 | 3.0 | 67.9 | 109 | 1 | 0.7 | 53.0 |
| 77 | 1 | 0.7 | 68.7 | 110 | 1 | 0.7 | 53.7 |
| 78 | 2 | 1.5 | 70.1 | 111 | 1 | 0.7 | 54.5 |
| 81 | 1 | 0.7 | 70.9 | 112 | 2 | 1.5 | 56.0 |
| 82 | 1 | 0.7 | 71.6 | 113 | 2 | 1.5 | 57.5 |
| 84 | 1 | 0.7 | 72.4 | 114 | 1 | 0.7 | 58.2 |
| 85 | 1 | 0.7 | 73.1 | 117 | 1 | 0.7 | 59.0 |
| 86 | 2 | 1.5 | 74.6 | 118 | 3 | 2.2 | 61.2 |
| 87 | 1 | 0.7 | 75.4 | 120 | 2 | 1.5 | 62.7 |
| 88 | 1 | 0.7 | 76.1 | 121 | 1 | 0.7 | 63.4 |
| 91 | 1 | 0.7 | 76.9 | 123 | 3 | 2.2 | 65.7 |
| 92 | 1 | 0.7 | 77.6 | 124 | 2 | 1.5 | 67.2 |
| 93 | 5 | 3.7 | 81.3 | 125 | 1 | 0.7 | 67.9 |
| 95 | 1 | 0.7 | 82.1 | 126 | 1 | 0.7 | 68.7 |
| 97 | 1 | 0.7 | 82.8 | 128 | 1 | 0.7 | 69.4 |
| 98 | 1 | 0.7 | 83.6 | 130 | 2 | 1.5 | 70.9 |
| 99 | 2 | 1.5 | 85.1 | 131 | 2 | 1.5 | 72.4 |
| 103 | 1 | 0.7 | 85.8 | 133 | 1 | 0.7 | 73.1 |
| 106 | 1 | 0.7 | 86.6 | 136 | 3 | 2.2 | 75.4 |
| 108 | 2 | 1.5 | 88.1 | 137 | 1 | 0.7 | 76.1 |
| 110 | 1 | 0.7 | 88.8 | 138 | 2 | 1.5 | 77.6 |
| 111 | 1 | 0.7 | 89.6 | 139 | 1 | 0.7 | 78.4 |
| 113 | 1 | 0.7 | 90.3 | 141 | 1 | 0.7 | 79.1 |
| 114 | 1 | 0.7 | 91.0 | 142 | 2 | 1.5 | 80.6 |
| 120 | 1 | 0.7 | 91.8 | 144 | 2 | 1.5 | 82.1 |
| 127 | 1 | 0.7 | 92.5 | 145 | 3 | 2.2 | 84.3 |
| 129 | 1 | 0.7 | 93.3 | 147 | 2 | 1.5 | 85.8 |
| 131 | 1 | 0.7 | 94.0 | 149 | 1 | 0.7 | 86.6 |
| 134 | 1 | 0.7 | 94.8 | 153 | 2 | 1.5 | 88.1 |
| 146 | 1 | 0.7 | 95.5 | 154 | 1 | 0.7 | 88.8 |
| 153 | 1 | 0.7 | 96.3 | 155 | 1 | 0.7 | 89.6 |
| 156 | 1 | 0.7 | 97.0 | 158 | 1 | 0.7 | 90.3 |
| 159 | 1 | 0.7 | 97.8 | 159 | 2 | 1.5 | 91.8 |
| 170 | 1 | 0.7 | 98.5 | 160 | 1 | 0.7 | 92.5 |
| 185 | 1 | 0.7 | 99.3 | 161 | 1 | 0.7 | 93.3 |
| 189 | 1 | 0.7 | 100.0 | 166 | 1 | 0.7 | 94.0 |
| | | | | 172 | 1 | 0.7 | 94.8 |
| | | | | 174 | 1 | 0.7 | 95.5 |
| | | | | 182 | 2 | 1.5 | 97.0 |
| | | | | 190 | 1 | 0.7 | 97.8 |
| | | | | 195 | 1 | 0.7 | 98.5 |
| | | | | 196 | 1 | 0.7 | 99.3 |

## TABLE 21

## Pre-and Post-Test Frequency Distributions of Detroit Tests of Learning Aptitude: Orientation

| Pre-Test | | | |
|---|---|---|---|
| Score | Freq. | Pct. | Cum. Pct. |
| -0 | 35 | 26.1 | 26.1 |
| 1 | 6 | 4.5 | 30.6 |
| 2 | 7 | 5.2 | 35.8 |
| 3 | 12 | 9.0 | 44.8 |
| 4 | 13 | 9.7 | 54.5 |
| 5 | 7 | 5.2 | 59.7 |
| 6 | 3 | 2.2 | 61.9 |
| 7 | 11 | 8.2 | 70.1 |
| 8 | 5 | 3.7 | 73.9 |
| 9 | 6 | 4.5 | 78.4 |
| 10 | 6 | 4.5 | 82.8 |
| 11 | 4 | 3.0 | 85.8 |
| 12 | 3 | 2.2 | 88.1 |
| 13 | 4 | 3.0 | 91.0 |
| 14 | 3 | 2.2 | 93.3 |
| 15 | 4 | 3.0 | 96.3 |
| 16 | 2 | 1.5 | 97.8 |
| 18 | 1 | 0.7 | 98.5 |
| 19 | 1 | 0.7 | 99.3 |
| 20 | 1 | 0.7 | 100.0 |

| Post-Test | | | |
|---|---|---|---|
| Score | Freq. | Pct. | Cum. Pct. |
| -0 | 4 | 3.0 | 3.0 |
| 1 | 2 | 1.5 | 4.5 |
| 2 | 2 | 1.5 | 6.0 |
| 3 | 1 | 0.7 | 6.7 |
| 4 | 1 | 0.7 | 7.5 |
| 5 | 5 | 3.7 | 11.2 |
| 6 | 1 | 0.7 | 11.9 |
| 7 | 3 | 2.2 | 14.2 |
| 8 | 6 | 4.5 | 18.7 |
| 9 | 8 | 6.0 | 24.6 |
| 10 | 7 | 5.2 | 29.9 |
| 11 | 7 | 5.2 | 35.1 |
| 12 | 10 | 7.5 | 42.5 |
| 13 | 6 | 4.5 | 47.0 |
| 14 | 10 | 7.5 | 54.5 |
| 15 | 12 | 9.0 | 63.4 |
| 16 | 16 | 11.9 | 75.4 |
| 17 | 8 | 6.0 | 81.3 |
| 18 | 6 | 4.5 | 85.8 |
| 19 | 6 | 4.5 | 90.3 |
| 20 | 6 | 4.5 | 94.8 |
| 21 | 2 | 1.5 | 96.3 |
| 22 | 2 | 1.5 | 97.8 |
| 23 | 1 | 0.7 | 98.5 |
| 24 | 1 | 0.7 | 99.3 |
| 25 | 1 | 0.7 | 100.0 |

## TABLE 22

## Pre-and Post-Test Frequency Distributions of Detroit Tests of Learning Aptitude: Social Adjustment B

| | Pre-Test | | |
|---|---|---|---|
| **Score** | **Freq.** | **Pct.** | **Cum. Pct.** |
| -0 | 47 | 35.1 | 35.1 |
| 1 | 6 | 4.5 | 39.6 |
| 2 | 5 | 3.7 | 43.3 |
| 3 | 10 | 7.5 | 50.7 |
| 4 | 6 | 4.5 | 55.2 |
| 5 | 5 | 3.7 | 59.0 |
| 6 | 5 | 3.7 | 62.7 |
| 7 | 8 | 6.0 | 68.7 |
| 8 | 7 | 5.2 | 73.9 |
| 9 | 6 | 4.5 | 78.4 |
| 10 | 6 | 4.5 | 82.8 |
| 11 | 5 | 3.7 | 86.6 |
| 12 | 4 | 3.0 | 89.6 |
| 13 | 2 | 1.5 | 91.0 |
| 14 | 4 | 3.0 | 94.0 |
| 15 | 2 | 1.5 | 95.5 |
| 16 | 2 | 1.5 | 97.0 |
| 20 | 1 | 0.7 | 97.8 |
| 23 | 2 | 1.5 | 99.3 |
| 36 | 1 | 0.7 | 100.0 |

| | Post-Test | | |
|---|---|---|---|
| **Score** | **Freq.** | **Pct.** | **Cum. Pct.** |
| -0 | 5 | 3.7 | 3.7 |
| 2 | 1 | 0.7 | 4.5 |
| 3 | 2 | 1.5 | 6.0 |
| 4 | 1 | 0.7 | 6.7 |
| 5 | 3 | 2.2 | 9.0 |
| 6 | 3 | 2.2 | 11.2 |
| 7 | 7 | 5.2 | 16.4 |
| 8 | 9 | 6.7 | 23.1 |
| 9 | 16 | 11.9 | 35.1 |
| 10 | 6 | 4.5 | 39.6 |
| 11 | 10 | 7.5 | 47.0 |
| 12 | 6 | 4.5 | 51.5 |
| 13 | 17 | 12.7 | 64.2 |
| 14 | 3 | 2.2 | 66.4 |
| 15 | 11 | 8.2 | 74.6 |
| 16 | 8 | 6.0 | 80.6 |
| 17 | 4 | 3.0 | 83.6 |
| 18 | 4 | 3.0 | 86.6 |
| 19 | 3 | 2.2 | 88.8 |
| 20 | 3 | 2.2 | 91.0 |
| 21 | 4 | 3.0 | 94.0 |
| 22 | 2 | 1.5 | 95.5 |
| 23 | 4 | 3.0 | 98.5 |
| 24 | 2 | 1.5 | 100.0 |

## TABLE 23

### Pre- and Post-Test Frequency Distributions of Detroit Tests of Learning Aptitude: Motor Speed

| Pre-Test | | | | Post-Test | | | |
|---|---|---|---|---|---|---|---|
| Score | Freq. | Pct. | Cum. Pct. | Score | Freq. | Pct. | Cum. Pct. |
| -0 | 24 | 17.9 | 17.9 | -0 | 4 | 3.0 | 3.0 |
| 1 | 3 | 2.2 | 20.1 | 1 | 1 | 0.7 | 3.7 |
| 2 | 3 | 2.2 | 22.4 | 3 | 1 | 0.7 | 4.5 |
| 3 | 2 | 1.5 | 23.9 | 4 | 1 | 0.7 | 5.2 |
| 4 | 1 | 0.7 | 24.6 | 5 | 3 | 2.2 | 7.5 |
| 5 | 4 | 3.0 | 27.6 | 6 | 2 | 1.5 | 9.0 |
| 6 | 3 | 2.2 | 29.9 | 9 | 1 | 0.7 | 9.7 |
| 7 | 7 | 5.2 | 35.1 | 10 | 2 | 1.5 | 11.2 |
| 8 | 4 | 3.0 | 38.1 | 11 | 3 | 2.2 | 13.4 |
| 9 | 3 | 2.2 | 40.3 | 12 | 2 | 1.5 | 14.9 |
| 10 | 3 | 2.2 | 42.5 | 13 | 5 | 3.7 | 18.7 |
| 11 | 3 | 2.2 | 44.8 | 14 | 4 | 3.0 | 21.6 |
| 12 | 7 | 5.2 | 50.0 | 15 | 3 | 2.2 | 23.9 |
| 13 | 3 | 2.2 | 52.2 | 16 | 8 | 6.0 | 29.9 |
| 14 | 8 | 6.0 | 58.2 | 17 | 5 | 3.7 | 33.6 |
| 15 | 2 | 1.5 | 59.7 | 18 | 5 | 3.7 | 37.3 |
| 16 | 8 | 6.0 | 65.7 | 19 | 5 | 3.7 | 41.0 |
| 17 | 2 | 1.5 | 67.2 | 20 | 1 | 0.7 | 41.8 |
| 18 | 7 | 5.2 | 72.4 | 21 | 4 | 3.0 | 44.8 |
| 19 | 4 | 3.0 | 75.4 | 22 | 4 | 3.0 | 47.8 |
| 20 | 3 | 2.2 | 77.6 | 23 | 4 | 3.0 | 50.7 |
| 22 | 1 | 0.7 | 78.4 | 24 | 7 | 5.2 | 56.0 |
| 23 | 1 | 0.7 | 79.1 | 25 | 3 | 2.2 | 58.2 |
| 24 | 4 | 3.0 | 82.1 | 26 | 2 | 1.5 | 59.7 |
| 25 | 1 | 0.7 | 82.8 | 27 | 8 | 6.0 | 65.7 |
| 26 | 2 | 1.5 | 84.3 | 28 | 1 | 0.7 | 66.4 |
| 27 | 1 | 0.7 | 85.1 | 29 | 7 | 5.2 | 71.6 |
| 28 | 3 | 2.2 | 87.3 | 30 | 2 | 1.5 | 73.1 |
| 30 | 2 | 1.5 | 88.8 | 31 | 3 | 2.2 | 75.4 |
| 32 | 3 | 2.2 | 91.0 | 32 | 5 | 3.7 | 79.1 |
| 33 | 1 | 0.7 | 91.8 | 33 | 3 | 2.2 | 81.3 |
| 34 | 2 | 1.5 | 93.3 | 34 | 3 | 2.2 | 83.6 |
| 35 | 1 | 0.7 | 94.0 | 36 | 1 | 0.7 | 84.3 |
| 36 | 4 | 3.0 | 97.0 | 37 | 1 | 0.7 | 85.1 |
| 41 | 1 | 0.7 | 97.8 | 38 | 2 | 1.5 | 86.6 |
| 48 | 2 | 1.5 | 99.3 | 39 | 2 | 1.5 | 88.1 |
| 50 | 1 | 0.7 | 100.0 | 40 | 1 | 0.7 | 88.8 |
| | | | | 44 | 1 | 0.7 | 89.6 |
| | | | | 45 | 1 | 0.7 | 90.3 |
| | | | | 46 | 3 | 2.2 | 92.5 |
| | | | | 47 | 3 | 2.2 | 94.8 |
| | | | | 48 | 2 | 1.5 | 96.3 |
| | | | | 51 | 1 | 0.7 | 97.0 |
| | | | | 54 | 2 | 1.5 | 98.5 |
| | | | | 55 | 1 | 0.7 | 99.3 |
| | | | | 58 | 1 | 0.7 | 100.0 |

Figure 5 depicts a population profile, based upon transformation of the raw scores to the mental age equivalents of the DTLA norms. Visual attention span for objects is an area in which the pre-test mean of 12.48 and the post-test mean of 22.48 failed to reach the minimum score of 24, which is the basis for the mental age of 3-0. Clearly, the subjects are deficient in this regard. Yet, the contrasting frequency distributions in Table 19 show that 88 per cent of the youngsters received scores of 23 and below in September, while this was reduced to 54 per cent in the follow up. Deutsch (1962) expresses concern over the memory deficits among preschool children, and he suggests that retardation in the development of memory systems is related to language inadequacies.

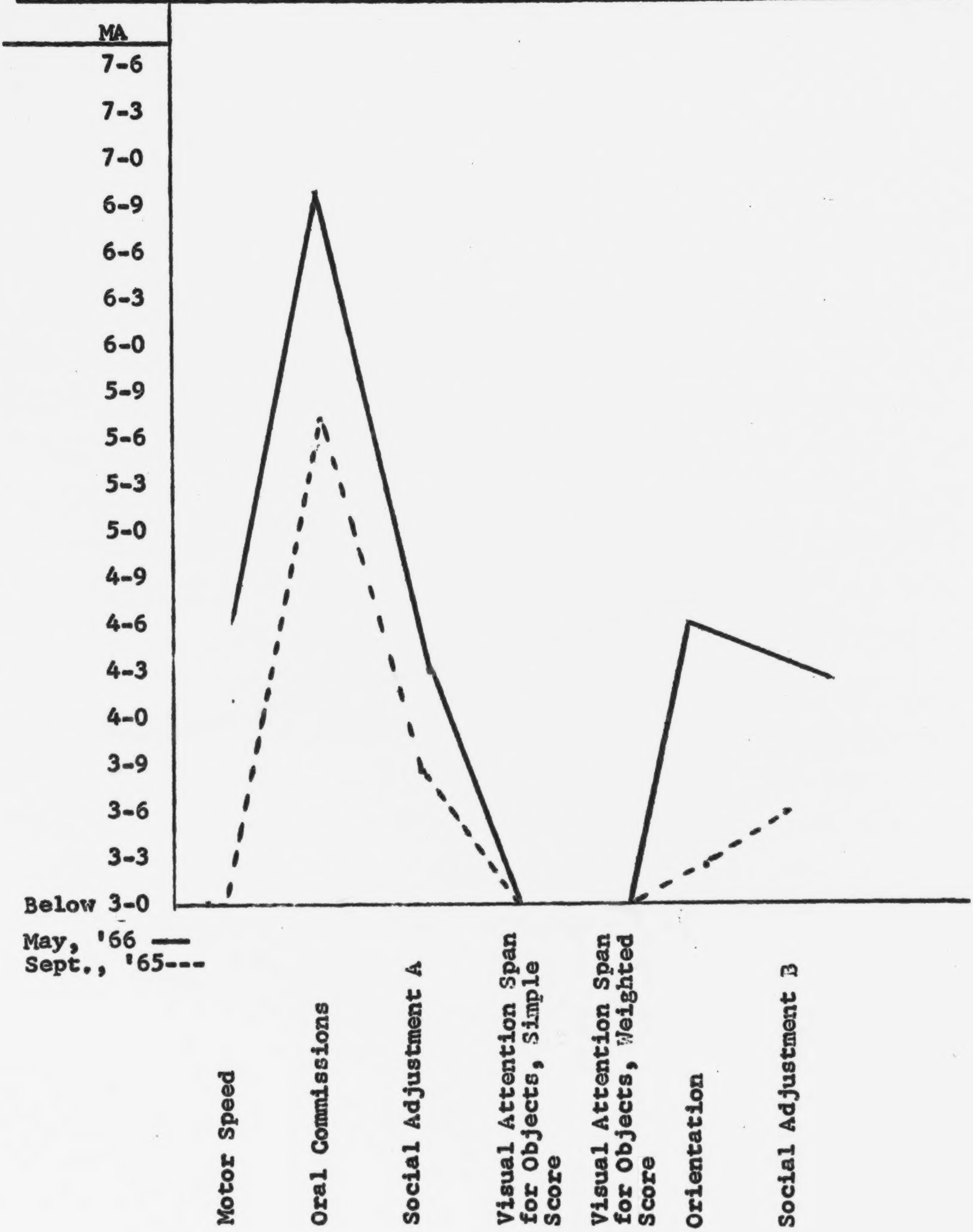
The area of social adjustment as shown by familiarity with civic information, common objects and responsibility in social situations is characterized by a post-test performance nearly equivalent to the age of the population.

Orientation, the response to acquired and conceptual information (i.e., "Are you older than your mother?" or "Can you touch the moon?") and motor speed, as measured by placing an "x" in a circle, represent areas of performance approximating the group age. The latter indicates remarkable post-test performance gains.

The ability of these youngsters to perform tasks in response to verbal stimuli, oral commissions, is an obvious

FIGURE 5

Pre- and Post-Test Mental Age Equivalence of Detroit Tests of Learning Aptitude



asset. Descriptively, the exceptional performance in this task causes other areas in a reasonably normal profile to appear deficient.

The post-test profile, with the exception of visual attention, is representative of the age expectancy for the subjects in the present project. The emphasis on the developmental sequence during the preschool program appears appropriate in light of the post-test DTLA results.

Figures 6 through 8 contain the DTLA profiles for the high, middle and low IQ samples. Among the three groups, there is considerable similarity in the pre-test profiles. Motor speed and visual attention span for objects are areas of considerable developmental deficit, while the capacity to follow oral commissions is a highly developed area. The post-test visual attention deficit remains for all three samples. The most apparent developmental improvement is in the area of motor speed among the high and middle IQ samples; the low IQ group continued to perform below a mental age of three years.

The brighter subjects responded most effectively to the program, whereas the low IQ group was less responsive. The responsiveness of the high and middle IQ groups to the program would seem to add some security to the instrumentation.

The lack of growth in mental age equivalents need not imply that the program was not beneficial. The raw score improvement of the low IQ sample in motor speed is

FIGURE 6A

Pre- and Post-Test Mental Age Comparisons on Detroit Tests of Learning Aptitude: High IQ Group (96-118)

| | Pre-Test | Post-Test |
|---|---|---|
| Motor Speed | BN | 4-9 |
| Oral Commissions | 5-9 | 7-3 |
| Social Adjustment A | 3-9 | 5-0 |
| Visual Attention Span for Objects, Simple Score | BN | BN |
| Visual Attention Span for Objects, Weighted Score | BN | BN |
| Orientation | 3-6 | 5-3 |
| Social Adjustment B | 3-6 | 4-6 |

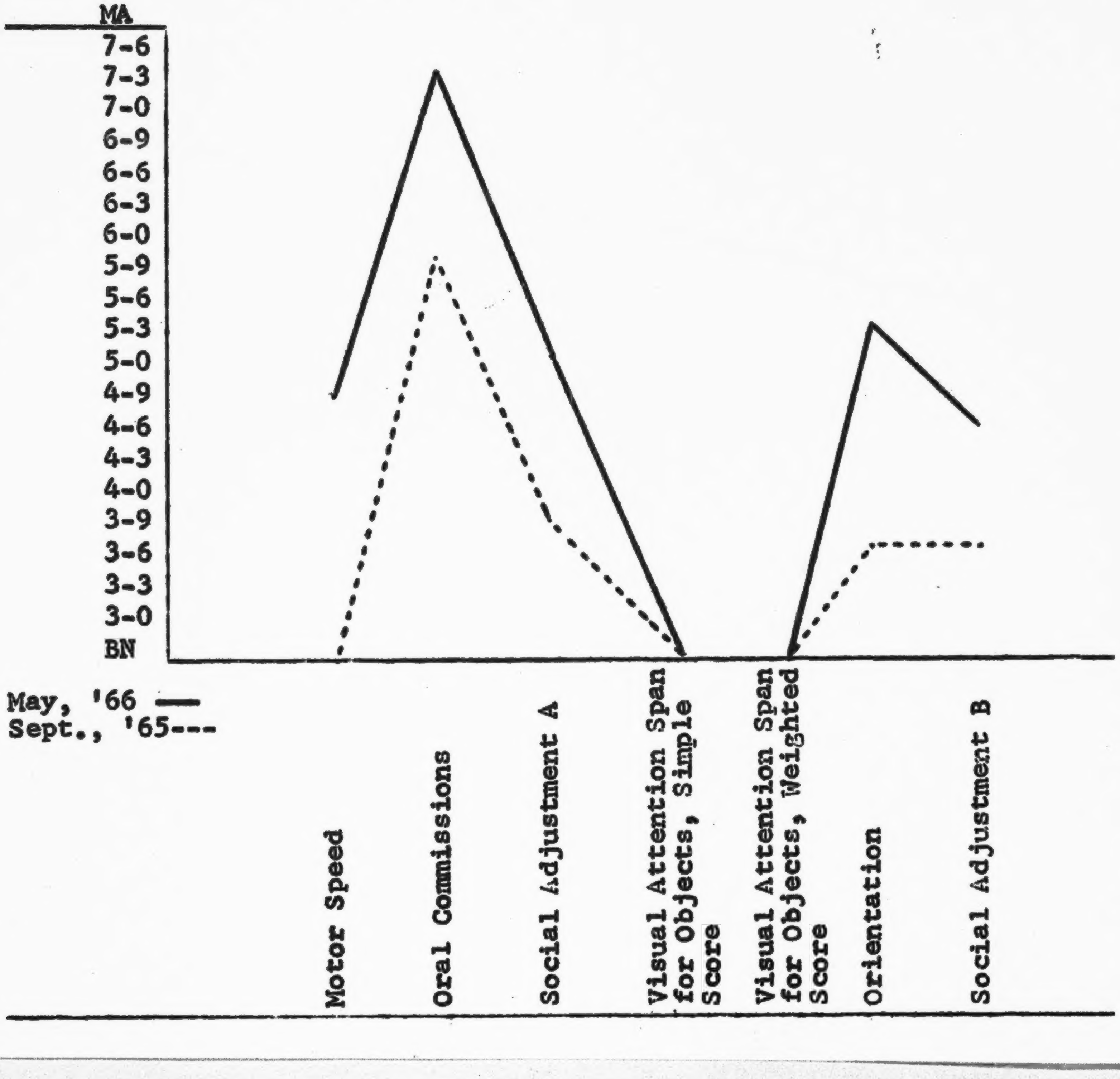


FIGURE 6B

Pre-and Post-Test Raw Score Comparisons on
Detroit Tests of Learning Aptitude:
High IQ Group (96-118)

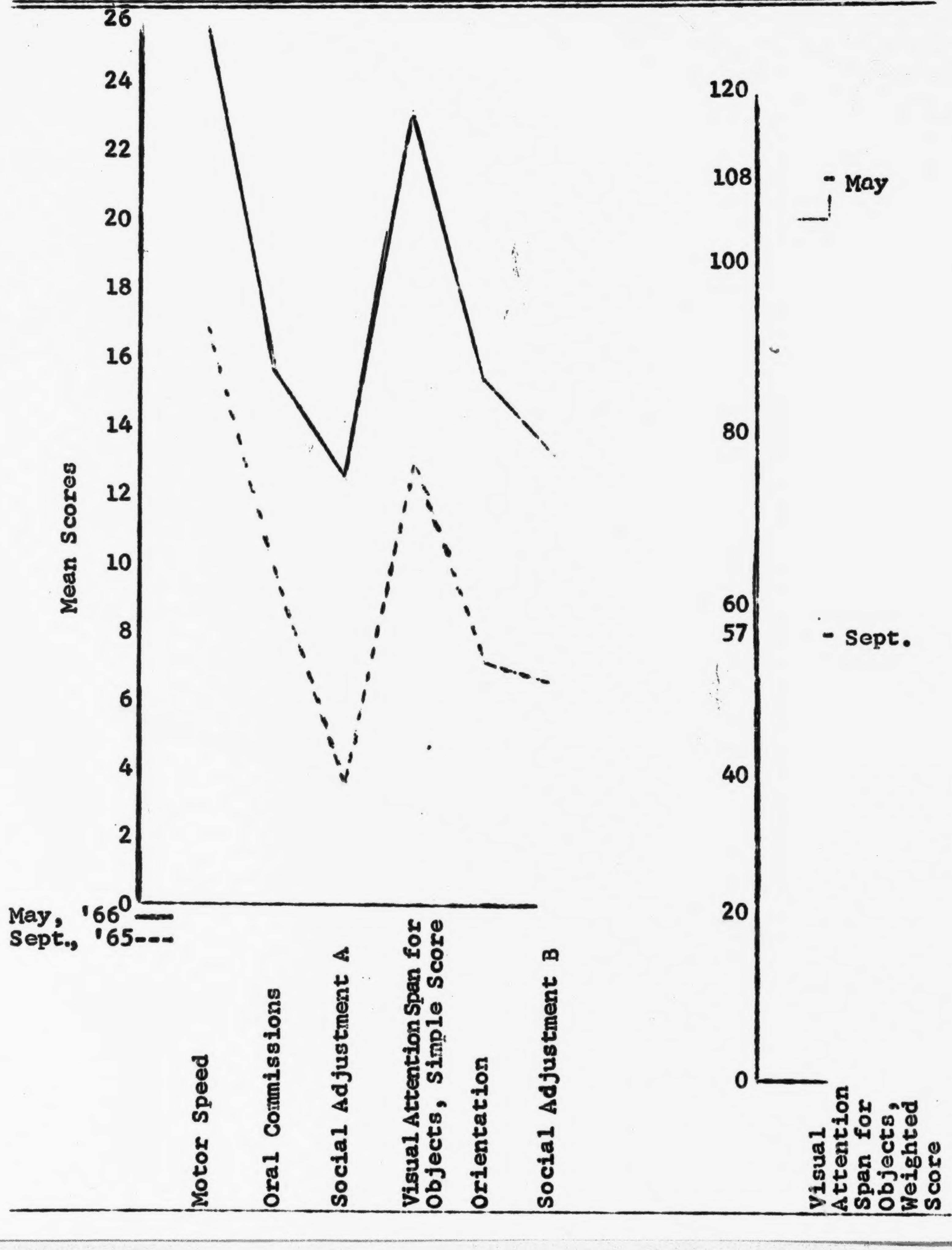


FIGURE 7A

Pre- and Post-Test Mental Age Comparisons on Detroit Tests of Learning Aptitude: Middle IQ Group (84-95)

| | Pre-Test | Post-Test |
|---|---|---|
| Motor Speed | BN | 4-9 |
| Oral Commissions | 5-9 | 7-0 |
| Social Adjustment A | 3-9 | 4-3 |
| Visual Attention Span for Objects, Simple Score | BN | BN |
| Visual Attention Span for Objects, Weighted Score | BN | BN |
| Orientation | 3-3 | 4-6 |
| Social Adjustment B | 3-3 | 4-3 |

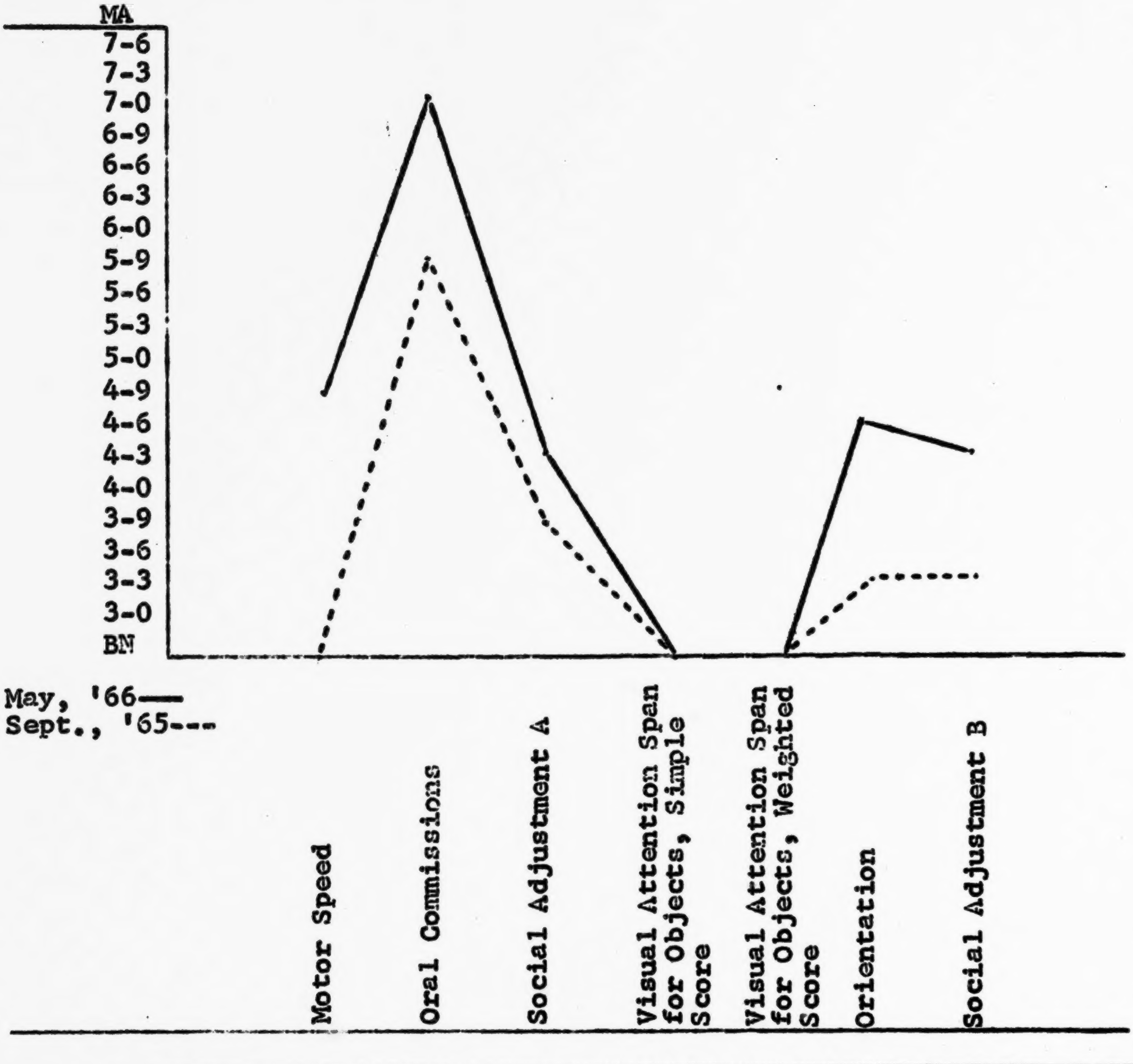
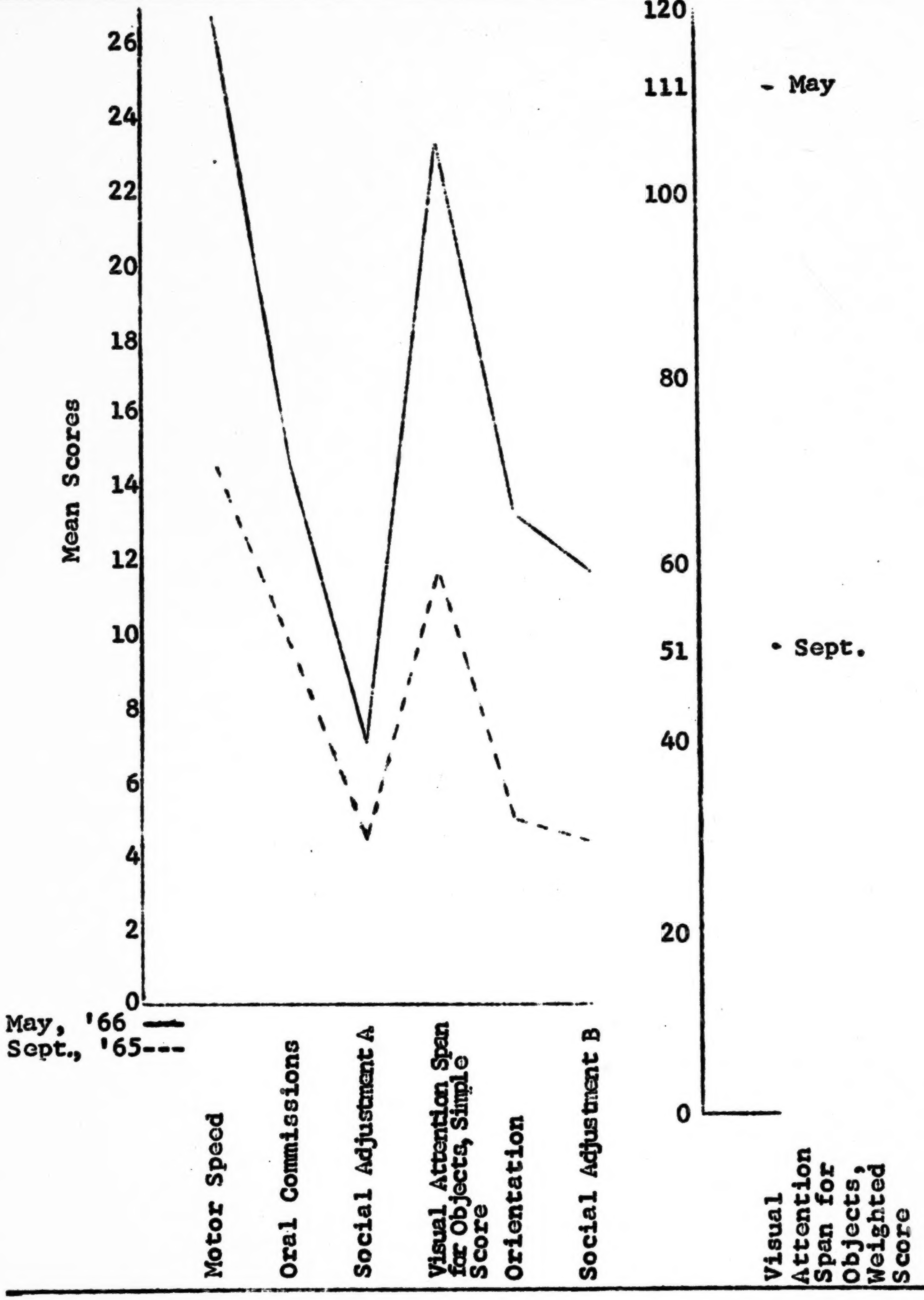


FIGURE 7B

**Pre-and Post-Test Raw Score Comparisons on Detroit Tests of Learning Aptitude: Middle IQ Group (84-95)**



## FIGURE 8A

## Pre- and Post-Test Mental Age Comparisons on Detroit Tests of Learning Aptitude: Low IQ Group (58-83)

| | Pre-Test | Post-Test |
|---|---|---|
| Motor Speed | BN | BN |
| Oral Commissions | 5-6 | 6-6 |
| Social Adjustment A | 3-6 | 3-9 |
| Visual Attention Span for Objects, Simple Score | BN | BN |
| Visual Attention Span for Objects, Weighted Score | BN | BN |
| Orientation | 3-0 | 4-0 |
| Social Adjustment B | 3-3 | 4-3 |

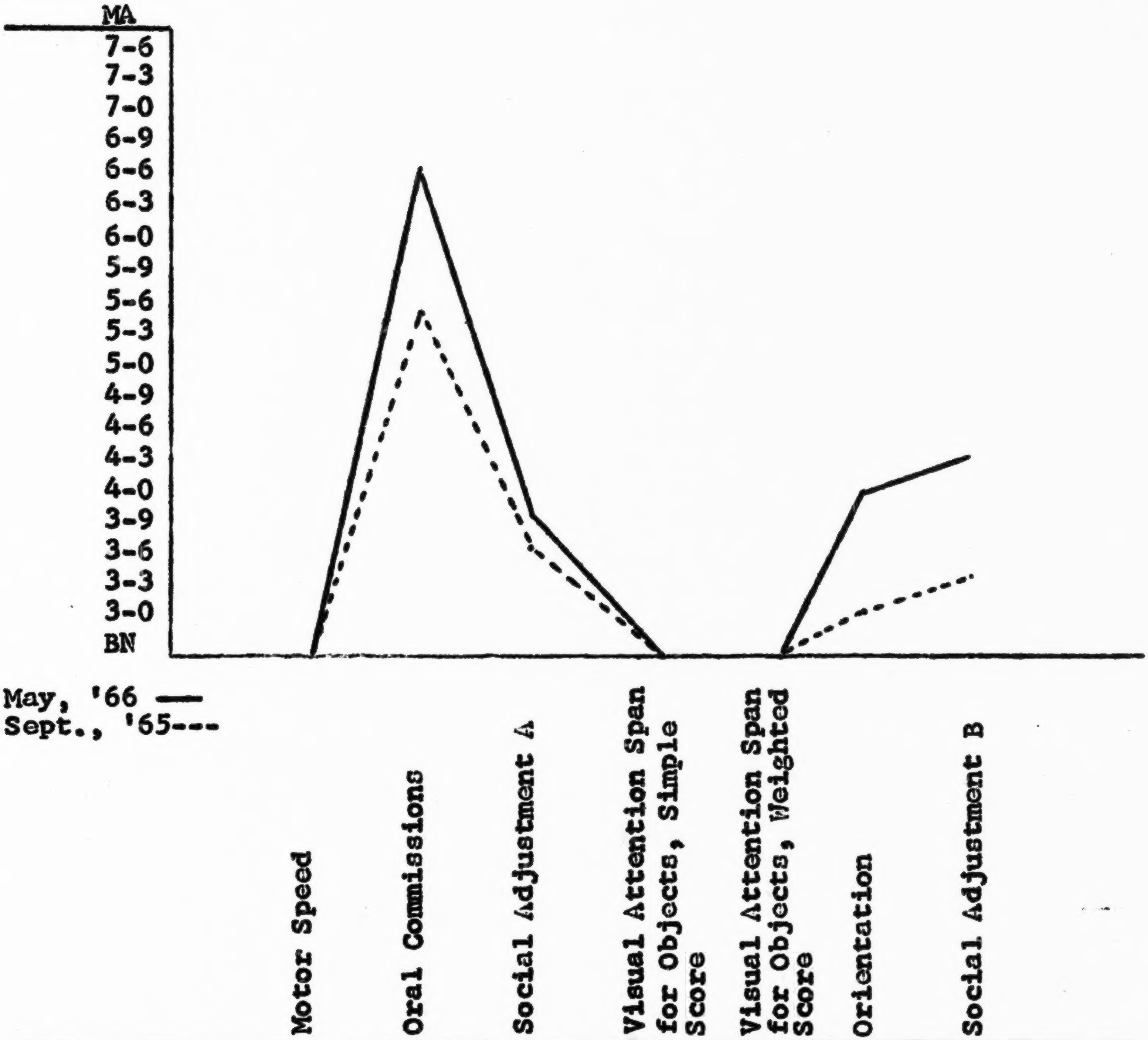
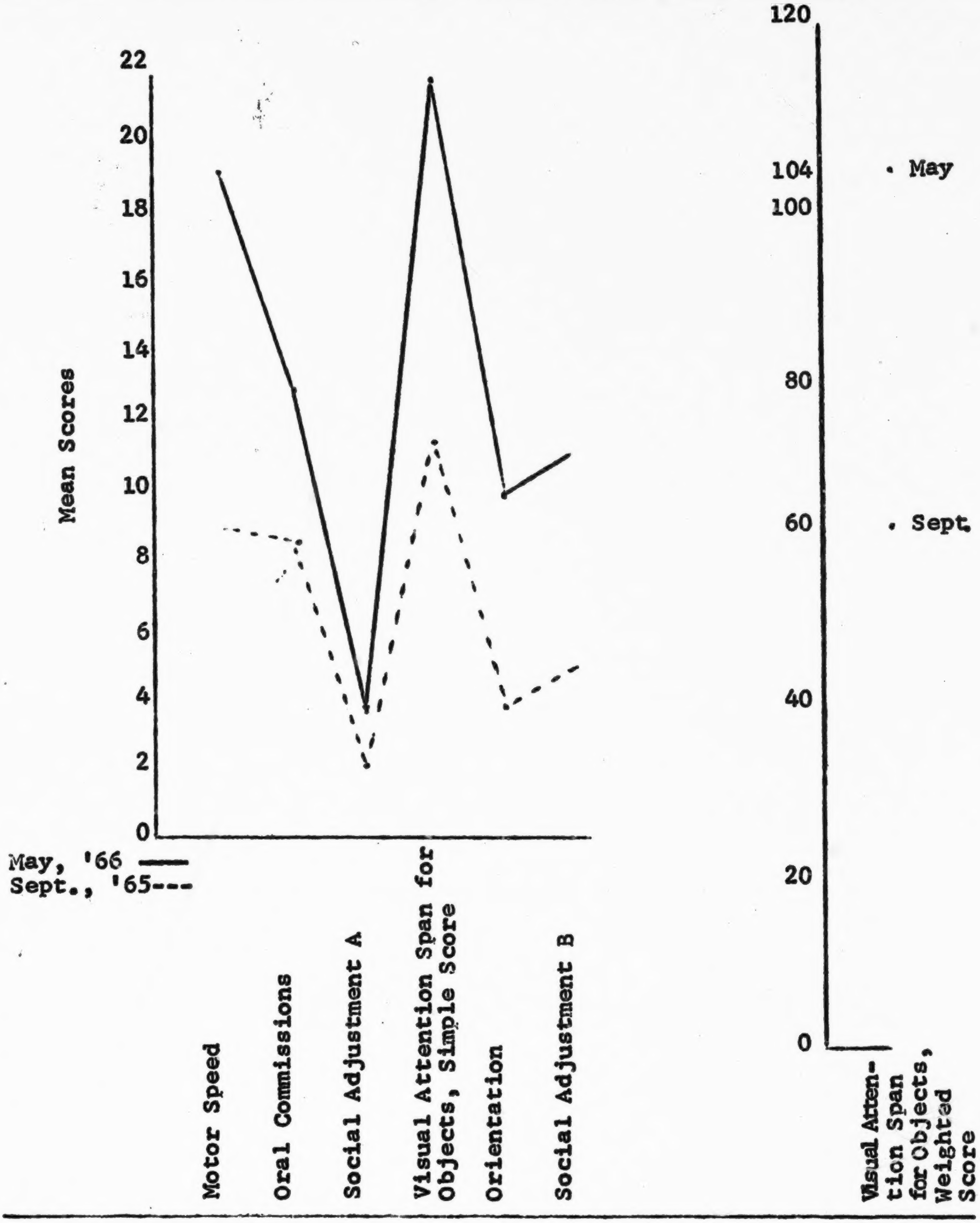


FIGURE 8B

Pre- and Post-Test Raw Score Comparisons on Detroit Tests of Learning Aptitude: Low IQ Group (58-83)



comparable to that of the other groups. They were further behind at the beginning and the program did not provide full compensation for these deficiencies.

## CONCLUSIONS AND RECOMMENDATIONS

The present study focused upon an assessment of the development and changes in behavior of children who participated in a headstart program. Since there were no comparisons with children who were not exposed to a preschool experience, there is no justification in validating headstart through this study. It is *clear, however, that the children who participated in headstart were aided by this participation. Whether or not they perform significantly greater than children who did not participate is a different issue.* Headstart appears to help children when they are in need of it; this is the crucial issue. Significant increases in intelligence quotients, psycholinguistic abilities and in learning aptitudes attest to the value of the preschool program.

The development and standardization of instrumentation for use with populations similar to that described herein is an area in need of considerable attention. This is particularly true of comprehensive batteries which might be employed to identify general and specific deficits. These batteries should be sufficiently sensitive to detect improvement and sophisticated enough to be utilized at repeated intervals.

The predictive validity of diagnostic procedures should be studied. A review of the literature concerning reading disability (Cawley, n.d.) indicates that learning deficits in the associative area, visual and auditory memory problems, perceptual-motor impairments and differences in the response to variations in stimulus materials are characteristics of children with reading problems. Longitudinal studies of these characteristics may enable research workers to introduce programs designed to ameliorate deficiencies which impair the acquisition of the basic academic skills.

The training of personnel to teach and assess the preschool disadvantaged child requires additional consideration. Teachers of preschool deprived children need background in the broad area of exceptionality and disability, as well as in the diagnosis and remediation of specific learning deficits.

Follow-up studies of headstart and non-headstart children appear justified. In this regard, academic achievement, intellectual behavior, language development and social development represent only a few of the areas under consideration. Creativity, coping style, problem-solving ability, responsiveness in experimentally developed learning paradigms, and modifications in the prevalence of learning disability are but a few of the areas which could be studied.

Comparisons between headstart and non-headstart children of divergent intellectual abilities ought to be undertaken.

In the present study, the performance of subjects assigned to different samples according to their intelligence quotients is characterized by differential gains. The gains in visual motor association, motor speed, social adjustment and orientation are likely outcomes of the non-specialized curricula. The deficits in vocal encoding, visual attention span, and visual-motor sequencing behavior may require specificity of treatment in order to be overcome.

Differential approaches to headstart are desirable. The possibilities exist that our present specific objectives and related curriculum are incompatible with the needs of children. Curricula based upon specific diagnostic patterns rather than a generalized program may produce long-term results which are presently undetermined. The transition to kindergarten and into the primary grades requires further study. There is a possibility that children who participate in a year-long headstart program should receive specific disability attention during the summer preceding their entrance into kindergarten.

Another major contribution of headstart could be the identification of developmental deficiencies in children and the initiation of a program which will counter the deficit pattern. The amelioration of developmental deficits in culturally disadvantaged children is too complex a problem to be solved by headstart alone.

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